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A REVISION OF THE PALAEARCTIC SPECIES OF THE NIGRIPES GROUP OF THE GENUS AGROMYZA FALLÉN (DIPTERA, AGROMYZIDAE)

BY

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INTRODUCTION

The species of the *nigripes* group of the genus *Agromyza* Fallén are exclusively feeders on Gramineae, including the cultivated forms. They often come to the notice of the applied entomologist, and there are numerous references to them in the literature. This paper, although written primarily from a taxonomical point of view, is intended also to assist the work of the applied entomologist. Past work in this field has sometimes been confused through the author failing to realise that he was dealing with more than one species with different life-histories; the host-relationships too have not hitherto been very clear. It is hoped that this paper will provide a sound taxonomic basis for future work.

The need for a complete revision of the group has been apparent for some time. The external characters of the adult do not provide many good specific differences, and it was clear that an attempt to use the characters of the male genitalia for classification needed to be made. These had not been employed by HENDEL (1931). Also the larval key hitherto in use, originating from DE MEIJERE (1943), has proved to be almost unworkable. I have decided to make a fresh start with a new key.

The terminology used for the external morphology of the adult in this paper is an English version of that of HENDEL (1931), as has been commonly used for the Agromyzidae. The genitalia and larval terminology largely follow FRICK (1952), though I have preferred the term "spine" to FRICK's "cuticular process". Figs. 1 and 2 explain the genitalia terminology. The plant names are as given in CLAPHAM, TUTIN and WARBURG (1952).

CHARACTERISATION OF THE GROUP

The term "*nigripes* group" is used in this paper in a narrow sense to include those grass-feeding species of *Agromyza* in which the costa reaches to m_{1+2}. It is closely related to the *ambigua* group, in which the costa only reaches r_{4+5}. This distinction may ultimately prove untenable on a world basis, but it is a convenient one for dealing with he Palaearctic species. The distinctive characters of these two groups may be summarised as follows.

Group of *nigripes* Meigen

External morphology

Lunule very narrow, occupying less than $^1/_4$ of the distance from the antennal base to the front ocellus: ocellar triangle coming to a point well before the front ocellus. Dorsocentrals basically six (four postsuturals and two presuturals), decreasing markedly in length forwards: in most species only three or four of the postsuturals are longer than the acrostichals. Mesonotum more or less shining. Inner post-alar bristle present. Legs coarsely haired: middle tibiae with a pair of outstanding posterodorsal bristles. Costa reaching m_{1+2}.

Male genitalia

Cerci elongate, club-shaped, with long hairs at their tips. Ninth sternite reaching $^1/_2$—$^2/_3$ of the length of the aedeagal apodeme. Postgonites small, rounded or club-shaped, closely adpressed to the pregonites: pregonites completely fused with the ninth sternite. Phallophore small, more or less triangular. Basiphallus consisting of a pair of broad plates, but subject to various modifications. Distiphallus of characteristic S-shape.

Larva

No patch of spines below the mandibles. Prothoracic girdle consisting of 8—12 rows of extremely minute spines. Spinal bands well developed at least on the metathorax and first three abdominal segments, consisting of short pointed spines with broad bases: these point dorsally or posteriorly.

Two species (*oryzae* and *distorta*) show special adaptation to an aquatic environment: the front spiracles (Fig. 47c) are enormously enlarged and bear at least 75 bulbs: there are patches of bristle-like spines on the locomotory humps (Kriechwülsten) of at least the metathorax and first three abdominal segments.

Group of *ambigua* Fallén

This group differs from the *nigripes* group in the following particulars.

External morphology

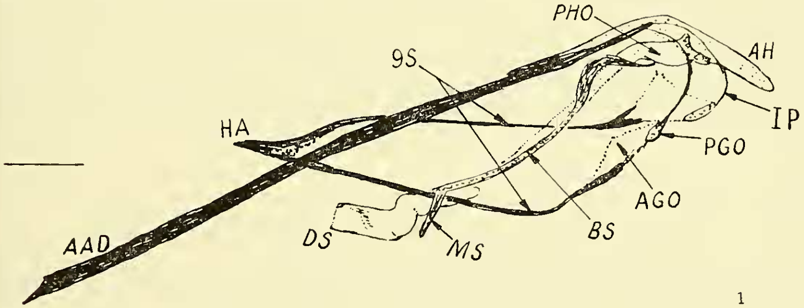
The dorsocentrals are stronger and although they decrease markedly in length forwards, in most species the two pairs of presutural dorsocentrals are still longer than the acrostichals. Costa reaching only r_{4+5}.

Male genitalia

The basiphallus and mesophallus are generally reduced to narrow strips of chitin which form a cradle for the large distiphallus. This is similar in form to that of the *nigripes* group, but longer than in most species of that group.

Larva

There is a characteristic patch of spines below the mandibles.



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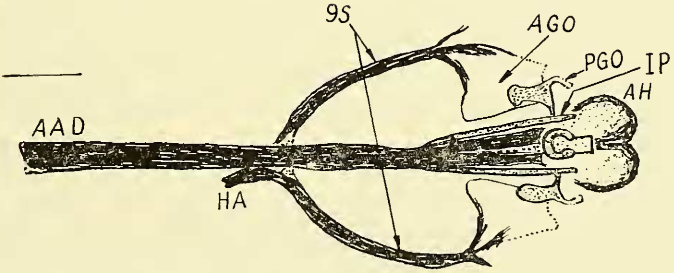

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Fig. 1. Male genitalia of *albipennis* Mg. in lateral view, showing the terminology employed.
Fig. 2. Aedeagal apodeme, 9th. sternite etc., of *nigripes* Mg. in dorsal view, showing the terminology employed.

AAD — Aedeagal apodeme;
AGO — Pregonite;
AH — Aedeagal hood;
BS — Basiphallus;
DS — Distiphallus;
HA — Hypandrial apodeme;
IP — Inner dorsal process of postgonite
MS — Mesaphallus;
PGO — Postgonite;
PHO — Phallophore;
9S — 9th sternite

The species which I can definitely include in the *ambigua* group are *ambigua* Fallén, *mobilis* Meigen, *nigrociliata* Hendel, *veris* Hering, *niveipennis* Zetterstedt, *ocellaris* Hendel, *nigrifemur* Hendel and *yanonis* Matsumura. Other species which probably belong here (but whose larvae and genitalia I have not examined) are *megalopsis* Hering and *frontosa* Becker.

Taken together the *nigripes* and *ambigua* group as defined above form a very natural unit, which contains a large number of species in many parts of the world. The form of the male genitalia is quite distinct from that of other species of *Agromyza,* and this character alone is sufficient to recognise a species as belonging here. SASAKAWA (1958) has found further characteristic features in the female genitalia. All the known larvae are feeders on Gramineae.

The only other grass-feeding species of *Agromyza* are the members of the small group of *cinerascens* Macquart, with three known species. These are *cinerascens* Macquart, *intermittens* Becker and *luteitarsis* Rondani. This group is not related to the *nigripes* and *ambigua* groups, and indeed in several features stands well apart from the rest of *Agromyza.* The genitalia of *cinerascens* are figured by HERING (1951b). The phallus is very elongate, quite different from that of most *Agromyza* species, though perhaps there is some approach to this condition in *Agromyza rubi* Brischke and *A. celtidis* Nowakowski. The cerci are very large and bear a patch of spines at their tips. The group is further distinct on various external characters, as given in HENDEL's (1931) key. The larvae, however, are still little known, and their description might throw some new light on the phylogeny of the Agromyzinae.

The *nigripes* group outside the Palaearctic region

The distribution of the *nigripes* group is probably worldwide. In North America two species are known (FRICK, 1959). *Agr. parvicornis* Loew is a pest of maize (*Zea mays* L.). The larval mouthparts are figured by PHILLIPS (1914) as having two large teeth; the hind spiracles of the puparium are only narrowly separated. This suggests a species closely related to the Palaearctic *phragmitidis* Hendel, *spenceri* sp.nov. and *hendeli* sp.nov. FRICK also records *nigripes*; this record however requires confirmation. I suspect from his description and figure that this species is *albipennis.*

Many of the species described for Africa by SPENCER (1959 and 1960) belong here, including *penniseti* Spencer, *susannae* Spencer, *pallidifrons* Spencer, *catherinae* Spencer, *oliviae* Spencer and *graminivora* Spencer. The life-history of two of these species, *penniseti* and *graminivora* is known. Some of these are close to Palaearctic species, but they all appear distinct. DE MEIJERE (1940) also described the larvae of two species from *Pennisetum* in Java.

COMMENTS ON EARLIER TREATMENTS OF THE GROUP

The following detailed criticism of DE MEIJERE's and HENDEL's work is necessary in order to clarify the points in which the present treatment disagrees with theirs, and to explain why I have felt it necessary to modify their conclusions.

DE MEIJERE in "Die Larven der Agromyzinen" (1925) described larvae of "*nigripes*" and *phragmitidis*. The first was described from *Phragmites* and refers to *hendeli* sp.nov. Both these descriptions are accurate.

In his first supplement (1928) he adds a description of the larva of *lucida* (as *airae* Karl), which is also accurate. The second supplement (1934) includes a short description of the larva of *albipennis*. This is erroneous in one important point: DE MEIJERE interprets the mandibles as consisting of two pairs of alternating teeth: in fact here are four pairs of non-alternating teeth.

In his seventh supplement (1943) he discusses the larvae of the group at some length and gives a key. This key is vitiated in two respects. First, the misinterpretation of the mouthparts of the *albipennis* larva noted above, secondly a confusion of the larvae of *hendeli* (as *lucida*) and *nigripes*. This must have occurred through confusion of the data as these larvae are easily distinguished from each other; in fact the key contradicts the earlier description of the *hendeli* larva (as *nigripes* in 1925) which was accurate. Also the textfigures accompanying this article are not properly labelled, and there is considerable doubt as to which species many of them represent. The result is that there has been a great deal of confusion over the larval characters of this group, as DE MEIJERE's key has been the only one hitherto available.

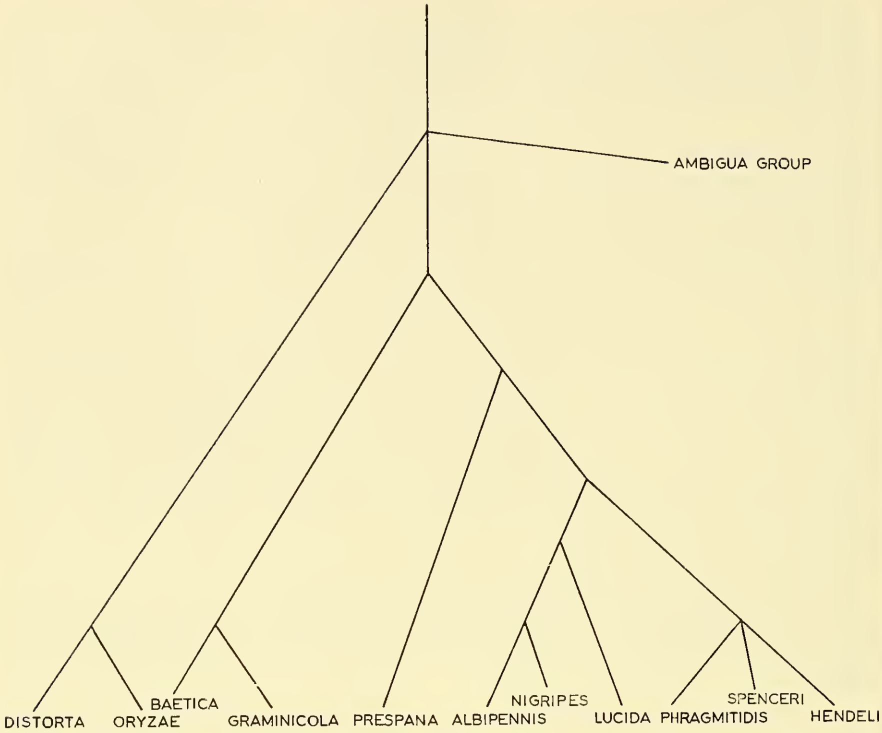
HERING in his "Bestimmungstabellen der Blattminen von Europa" (1957) unfortunately incorporated DE MEIJERE's key into his work and perpetuated these errors, as no subsequent studies had been made of the larval morphology of this group.

The study of this group owes a great deal to HENDEL. However there are two points on which his treatment in "Die Fliegen der paläarktischen Region" (1931) requires criticism. First, although the specimens which he used to describe *albipennis* and *nigripes* were correctly determined, his use of the relative width in profile of the cheeks and jowls as diagnostic characters to separate these species cannot be upheld. The key given is accordingly misleading on this point.

The second point of criticism is more serious. In 1920 he described *Agr. lucida* from a swept specimen: later he identified flies bred by HERING from *Phragmites* with this species. When writing his later description, HENDEL (1931) described one of these specimens, not the type (not unreasonably, as the type is pinned directly on a long fragile pin and is dangerous to handle). Unfortunately HENDEL had included two species under the name *lucida,* and his 1931 description does not refer to the same species as the type. Consequently the name has been employed incorrectly for the *Phragmites*-feeding species ever since. In this paper the name *lucida* is returned to the original species, and the *Phragmites*-feeding species redescribed as *hendeli* sp.nov. I have made HENDEL's specimens the types of this.

PHYLOGENY

In this assessment of the relationship between the various members of the *nigripes* group I have tried to take account of the larval and genitalia characters, as well as the external morphology of the adult. The best generic characters are in fact to be found in the larval stages, which are far easier to classify than the adults.



Graph I. Phylogeny tree of the *Agromyza nigripes* group

There are two obvious pairs of species. *A. oryzae* and *A. distorta* both have dimorphic puparia, and the larvae are strikingly modified in adaptation to an aquatic environment. The enormously enlarged front spiracles (Fig. 47c) of these species are unparalleled elsewhere in the Agromyzidae. The strong dorsocentrals too are characteristic of both these species. The genitalia and external morphology of the adult however show that these species are best classified as aberrant members of the *nigripes* group.

Another obvious pair of species is formed by *A. graminicola* and *A. baetica.* Both have identical large antennae (Figs. 23 and 24), and their mesophalli (Figs. 12c and 13c) are modified to form club-shaped appendages. The striking genitalia modifications of *baetica* are clearly of recent origin. The separation of these species must be due to recent geographical isolation.

Three species, *phragmitidis, hendeli* and *spenceri,* all produce identical mines on *Phragmites.* They have a very characteristic habit of laying a row of eggs on the leaf, which at once distinguishes their mines from those of other species. The larval mandibles of all three are identical (Figs. 41a, 42a and 43a), and they all possess narrow ejaculatory bulbs (Figs. 8a, 9a and 10a), and fairly large distiphalli. Therefore in spite of the external differences, I have no doubt that these three species are closely related.

The evidence for placing *albipennis, nigripes* and *lucida* together is also strong. *A. nigripes* and *A. lucida* are close in respect of their genitalia, and, although the *albipennis* genitalia are very characteristic, in external facies and larva it stands very close to *nigripes.* All these species have a broad frons (in contrast to the *Phragmites*-feeders mentioned above).

A. prespana is not classified so easily. The genitalia of this species (Fig. 11) are fairly typical of the group, but the larval characters do not allow it to be closely associated with any of the above groups. The mandibles (Fig. 44a) have two teeth, but are small, and the hind spiracles (Fig. 44d) are widely spaced and situated on obvious projections.

We are thus left with four species-groups and *A. prespana* as species sola. However the differences which distinguish the *oryzae/distorta* and *graminicola/baetica* groups are obviously much more radical than those separating the rest. Probably their separation must antedate that of the other groups.

It is also interesting to note which characters prove to be of no phylogenetic value. The colour of the squamal fringe is a good specific character, but of no generic importance. The antennae too are enlarged in several not closely related species (viz., *hendeli* and *albipennis/nigripes*): clearly a tendency to variation in the shape of the antennae is part of the ancestral genetic make-up of this group. In classifying the larvae too we must take account of the shape of the mandibles, not merely the number of teeth. Six species have larvae with two teeth, but there are differences in the shape of the mandibles. The three *Phragmites* species, *phragmitidis, hendeli* and *spenceri*, have large broad mandibles: those of *graminicola* and *baetica* are narrower, and those of *prespana* smaller still. Probably two was the original number of teeth for the group, and its retention therefore not necessarily indicative of close affinity. The large number of teeth shown by two species-groups would then represent an innovation. The fact that de Meijere's Javan species (1940) and the American *A. parvicornis* Loew (Phillips, 1914) also possess two teeth lends support to this view.

Host relationship

A balanced assessment of the degree of host specialisation in this group is hampered by two difficulties. First the botanists' ideas on the classification of the Gramineae are not yet very stable. Secondly our knowledge of the host-range of Agromyzids is largely biased in favour of the more easily recognised grasses, such as *Phragmites, Glyceria, Phalaris* and *Deschampsia.* Accurate records from other hosts are relatively meagre, but this is clearly more the fault of the entomologists than the flies.

However, regarding these four hosts, one can speak with reasonable certainty. The first striking fact is that *Phragmites* is the host of five monophagous species. This is clearly good circumstantial evidence for botanical systems which make the Arundineae a separate tribe. Of the other three hosts, *Glyceria* and *Deschampsia* share two species, neither of which occurs on *Phalaris,* while *albipennis,* which is abundant on *Phalaris* and occurs on many other grasses (particularly the Hordeae), never occurs on *Glyceria,* though it was once bred from *Deschampsia.* Probably we should be unwise to base any argument on the host-selection of *albipennis* which is clearly very catholic in its tastes: but the fact that *lucida* is common on these two plants and rarely occurs on any others does seem of significance. We thus have a priori grounds for welcoming a possible connection between the Glycerieae and Aveneae, but they are admittedly not based on very strong evidence in the present state of our knowledge of this group.

The following list uses the classification given in CLAPHAM, TUTIN and WARBURG (1952).

* recorded from this host once only.

Oryzeae	*Oryza sativa* L.	*oryzae* (Munakata)
	Zizania latifolia Turcz.	*oryzae* (Munakata)
Arundineae	*Phragmites communis* Trin.	*baetica* sp.nov.
		graminicola Hendel
		hendeli sp.nov.
		phragmitidis Hendel
		spenceri sp.nov.
Glycerieae	*Glyceria maxima* (Hartm.) Holmb.	*distorta* Griffiths
		lucida Hendel
		nigripes Meigen
	Glyceria fluitans (L.) R.Br.	*nigripes* Meigen
Festuceae	*Festuca* sp.	*_albipennis_ Meigen
	Poa spp.	*albipennis* Meigen
	Echinaria capitata Desf.	*_lucida_ Hendel
Brachypodieae	*Brachypodium sylvaticum* (Huds.) Beauv.	*nigripes* ssp. *brachypodii* ssp. nov.
Hordeae	*Triticum aestivum* L.	*prespana* Spencer
		*_albipennis_ Meigen
	Secale cereale L.	*_albipennis_ Meigen
	Hordeum spp.	*albipennis* Meigen
Aveneae	*Arrhenatherum elatius* (L.) J. & C. Presl.	*_albipennis_ Meigen
	Holcus spp.	*nigripes* Meigen
	Deschampsia caespitosa (L.) Beauv.	*lucida* Hendel
		*_albipennis_ Meigen
		*_nigripes_ Meigen
Agrosteae	*Agrostis stolonifera* L.	*_albipennis_ Meigen
	Agrostis canina L.	*_nigripes_ Meigen
	Phleum pratense L.	*_albipennis_ Meigen
Phalarideae	*Phalaris arundinacea* L.	*albipennis* Meigen
	Phalaris erucaeformis L.	*albipennis* Meigen
Paniceae	*Setaria viridis* Beauv.	*_albipennis_ Meigen

I note that in many classifications the Seslerieae (including *Echinaria*) are erected as a separate tribe and placed next to the Aveneae. This certainly makes the record of *lucida* from that plant look more reasonable: *lucida* obviously has a narrow range of hosts.

There are many references in the literature on Applied Entomology to "*Agromyza nigripes*" occurring as a pest of cereal crops. Unfortunately very few of the specimens concerned have been examined by specialists, and I have thought it best to disregard these records for the purpose of this paper. The available evidence suggests that these records will mainly refer to *A. albipennis,* which is clearly the commonest species on the Hordeae. This species has been confirmed on barley in Japan and Germany, and on wheat in Great Britain. The other species which has occurred on wheat is the recently discovered *A. prespana,* which may possibly be found in Britain. References to "*Agr. nigripes*" having only one generation a year might well apply to this species. The record of true *A. nigripes* has not been confirmed from cereal grasses.

Discussion of the host selection of the individual species in cases where oligophagy occurs will be found under the species concerned.

KEYS FOR IDENTIFICATION

ADULTS[1])

1. 5 of 6 pairs of dorsocentrals clearly developed as bristles, exceeding the height of the acrostichals in profile (1 or 2 pairs being presutural). Eyes with short white pubescence. On aquatic grasses 2

— At most only the four postsutural dorsocentrals clearly visible as bristles in profile. Eyes bare or weakly pubescent 3

2. Frons broad, $1^1/_2$—2 times the eye-width; 2—3 strong lower orbital bristles (Fig. 23). Ocellar bristles reaching as far as the base of the 2nd upper orbitals. Acrostichals 8-rowed. ♂: ejaculatory bulb (Fig. 14a) small, transparent in distal $^1/_3$, the central channel reaching $^2/_3$ of its length; thorn-like process of the left side of the mesophallus (Fig. 14c) very strongly developed. Europe. On *Glyceria maxima* . . . . *distorta* Griffiths

— Frons narrower: normally 3—5 short lower orbital bristles (Fig. 26). Ocellar bristles very short, not reaching as far as the base of the 2nd upper orbitals. Acrostichals 6-rowed. ♂: ejaculatory bulb (Fig. 15a) larger, moderately sclerotised except along its distal edge; central channel reaching nearly the distal edge; mesophallus without thorn-like process. Siberia and Japan. On *Oryza* and *Zizania* . . . . *oryzae* (Munakata)

3. Squamal fringe white 4

— Squamal fringe normally ochreous; wing-membrane brownish tinged. Normally only 4 orbital bristles (Fig. 17). Frons broad, 1.2—1.8 times the eye-width. 3rd antennal segment somewhat broadened apically: *nigripes* Meigen[2]) . 8

— Squamal fringe black 9

4. 3rd antennal segment small and rounded (Fig. 21); 5 orbital bristles, usually

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[1]) Excluding *lunulata* Sasakawa.

[2]) A very common, variable species. If squamal fringe darker (as often in Scandinavian specimens) it may be confused with *lucida* or *hendeli*; the former is distinguished by the shape of the antennae: the latter by the narrower frons and more numerous orbital bristles.

fairly weak. Narrow frons (0.8—1.2 times the eye-width). ♂: ejaculatory bulb (Fig. 10a) dark and narrow. On *Phragmites*. . . *phragmitidis* Hendel

— 3rd antennal segment larger. ♂: ejaculatory bulb broader and paler . . 5

5. 3rd antennal segment very much enlarged (Figs. 23 and 24). At least the first pair of lower orbital bristles directed more or less backwards. ♂: ejaculatory bulb not so broad: mesophallus (Figs. 12c and 13c) developed into a pair of club-shaped appendages 6

— 3rd antennal segment not enlarged so much (Fig. 16). Lower orbitals all directed more or less inwards. ♂: ejaculatory bulb (Figs. 3a and 4a) broad; mesophallus not as above: *albipennis* Meigen 7

6. 4—5 orbital bristles (Fig. 23). Frons narrow, 1—1.3 times the eye-width. Eyes bare. ♂: 9th sternite symmetrical: aedeagal apodeme normal. Northern, central and eastern Europe. On *Phragmites*. . . . . *graminicola* Hendel

— 5—6 orbital bristles (Fig. 24). Frons broader, 1.5 times the eye-width. Eyes with short pubescence. Cheeks and orbits clearly visible in profile. ♂; 9th sternite asymmetrical (Fig. 13d), the left side about twice as long as the right; aedeagal apodeme considerably broadened posteriorly. Southern Spain. On *Phragmites* . . . . *baetica* sp.nov.

7. ♂: ejaculatory bulb (Fig. 3a) broad, scallop-shaped. Common species. On various grasses, especially *Phalaris* . . . . . . *albipennis* Meigen s.s.

— ♂: ejaculatory bulb (Fig. 4a) very short, much wider than high, with a contrasting black central channel which bifurcates at its tip. Finland. . . . . *albipennis fennica* subsp. nov.

8. Wing length 2.0—2.8 mm. ♂: ejaculatory bulb (Fig. 5a) with its distal edge at least partially black. Common species. On *Glyceria, Holcus* and other grasses . . . . *nigripes* Meigen s.s.

— Wing-length 1.8—2.2 mm. ♂: ejaculatory bulb (Fig. 6a) mostly transparent, but with an obvious black patch at its base on one side. Corsica. On *Brachypodium* . . . . *nigripes brachypodii* subsp. nov.

9. 3rd antennal segment sexually dimorphic (Figs. 22 and 22a), in the female longer than high with a short fringe of upturned hairs, in the male larger, with a very long fringe. Antennae pointing downwards, the frons projecting above them. Facial keel clearly projecting in profile. On *Triticum* . . . . *prespana* Spencer

— 3rd antennal segment without such a fringe. Facial keel not prominent. Antennae not markedly pointing downwards 10

10. 3rd antennal segment enlarged (Fig. 19). 5—6 strong orbital bristles, directed more or less backwards. Frons narrow, 0.8—1.2 times the eye-width. ♂: ejuculatory bulb (Fig. 8a) narrow and black. On *Phragmites* . . . . *hendeli* sp.nov. (= *lucida* Hendel 1931 p.p. nec 1920)

— 3rd antennal segment small and rounded, 4—5 orbital bristles 11

11. 4th costal segment short (Fig. 31): ratio of 2nd to 4th costal segments 4—4.2. Face-line very flattened (Fig. 20). ♂: characteristic enlarged distiphallus (Fig. 9b). Alpine species. On *Phragmites* . . . . . . *spenceri* sp.nov.

— 4th costal segment longer (Fig. 29): ratio of 2nd to 4th costal segments 2.7—4.0. Face-line not so obviously flattened (Fig. 18). ♂: distiphallus (Fig. 7b) of moderate size, rather elongate. Widespread. Mainly on *Deschampsia* and *Glyceria* . . . . *lucida* Hendel (= *airae* Karl)

LARVAE

1. Mandibles (Fig. 47a) with 5 (rarely 4) alternating teeth. Front spiracles (Fig. 47c) large and circular with at least 75 bulbs. At least the metathorax and first three abdominal segments with thick patches of bristle-like spines ventrally on the locomotory humps (Kriechwülsten). On aquatic grasses . 2

— Mandibles with 2—4 teeth, not or only slightly alternating. Front spiracles small, with less than 25 bulbs. No special spines ventrally 3

2. Front spiracles with 75—160 bulbs. Patches of bristle-like spines on the locomotory humps present on mesothorax, metathorax and all abdominal segments. Japan and Siberia. On *Oryza* and *Zizania* . . *oryzae* (Munakata)

— Front spiracles (Fig. 47c) with 200—250 bulbs. Patches of bristle-like spines on the locomotory humps present only on metathorax and first three abdominal segments. Europe. On *Glyceria maxima* . . . . . . *distorta* Griffiths

3. Mandibles with 2 teeth 4

— Mandibles (Fig. 40a) with 3 teeth. Mesothoracic girdle absent. 6th to 8th abdominal segments with clear bands of spines laterally. Mainly on *Glyceria* and *Deschampsia* . . . . *lucida* Hendel (= *airae* Karl)

— Mandibles with 4 teeth (Figs. 38a and 39a). Mesothoracic girdle represented by at least a patch of spines ventrally 8

4. Hind spiracles separated by more than twice their own width. Eggs laid singly near the edge of the leaf 5

— Hind spiracles separated by less than twice their own width. Eggs laid usually in a row of 3 or 4, the resulting larvae producing a communal mine. On *Phragmites* 7

5. Hind spiracles only on small projections. On *Phragmites* 6

— Hind spiracles (Fig. 44d) on large projections. Mandibles (Fig. 44a) relatively small. On *Triticum* . . . . *prespana* Spencer

6. Adjacent bulbs of the hind spiracles (Fig. 46d) forming an angle of 80°. Pupation outside the mine. Southern Spain . . . . *baetica* sp.nov.

— Adjacent bulbs of the hind-spiracles (Fig. 45d) forming an angle of 90°—100°. Pupation in the mine. Northern, central and eastern Europe . . . . *graminicola* Hendel

7. Processes of the paraclypeal phragma (Fig. 42b) consisting of transparent chitin . . . . *phragmitidis* Hendel

— Processes of the paraclypeal phragma (Figs. 41b and 43b) consisting of mainly brown and black chitin . . . . *hendeli* sp.nov. (= *lucida* Hendel 1931 p.p. nec 1920) and *spenceri* sp. nov. (Alpine species).

(No larval preparation of *spenceri* was available for close comparison).

8. Hind spiracles (fig. 39d) contiguous: their adjacent bulbs forming an angle of 80°. On various grasses, especially *Phalaris* . . . *albipennis* Meigen

— Hind spiracles (Fig. 38d) separated by 1½—2 times their own width: their adjacent bulbs forming an angle of 100°. On *Glyceria, Holcus* and other grasses . . . . *nigripes* Meigen

A. nigripes brachypodii subsp. nov. was bred from *Brachypodium* in Corsica. Larval morphology not known.

DESCRIPTIONS

Agromyza albipennis Meigen 1830

Agromyza albipennis Meigen, 1930, Syst. Beschr. bekann. eur. zweifl. Insekt,, vol. 6, p. 171.

Agromyza albo-hyalinata Zetterstedt, 1848, Dipt. Scand., vol. 7, p. 2742. Syn. nov.

Agromyza nigripes Hendel (nec Meigen) pro parte, 1920, Arch. Naturgesch., vol. 84, p. 112.

Textfigures 1, 3a, 3b, 3c, 16, 27, 39a, 39b, 39c, 39d, 48.

The Zetterstedt species *albo-hyalinata* is synonymised as a result of my examination of the ♂ genitalia of the type.

Frons of the broader type, 1.2—2 times the width of an eye at the level of the front ocellus; not or only slightly narrowing forwards. Antennae a little separated at their bases. In profile (Fig. 16) the cheeks and orbits usually clearly visible as a narrow ring around the eye, often slightly projecting at the level of the antennae.

Ratio of the eye height to the height of the jowls usually 3.5—5 (though occasionally the jowls may be narrower, the ratio being as much as 11). 4—5 orbital bristles (one specimen has 6 on one side only). Upper and lower orbitals clearly distinguished, the later directed inwards or inwards and backwards. When a third lower orbital bristle is present this is usually small. Third antennal segment somewhat broadened apically with a rounded tip. Colour of head variable: usually at least the first antennal segment pale; sometimes the frons and the first two antennal segments yellowish brown.

6—8 rows of acrostichals. Legs variable in colour. Usually at least the front femora yellow at their tips. Often the tips of all femora, and the front tarsi yellowish. Sometimes however the legs are completely black.

Ratio of 2nd and 3rd costal segments (Fig. 27) 2.5—4.0; 2nd and 4th 3.5—5. Wing tip usually between the ends of r_{4+5} and m_{1+2}. All wing veins, except sometimes the costa, yellowish, especially towards the base of the wing. Membrane transparent or slightly whitish tinged. Squama white with a white fringe, only its border being sometimes yellowish. Wing length 2.0—3.0 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the end of the aedeagal hood about 1 mm. The aedeagal apodeme is conspicuously thickened at its anterior end and slightly bent downwards over its length. The strengthened part posterior to the attachment of the inner processes of the postgonites occupies about $1/_5$ of the whole apodeme. The 9th sternite is long, strongly bowed downwards especially towards the tip. Hypandrial apodeme not clearly differentiated, being more or less continuous with the 9th sternite. The tip of the hypandrial apodeme reaches $^2/_3$ of the length of the aedeagal apodeme. Pregonites as shown for *nigripes* (Fig. 2) though relatively smaller. Postgonites small, more or less club-shaped, similar to those of *nigripes* (Fig. 2). Aedeagal hood weakly chitinised; its width about twice that of the posterior end of the aedeagal apodeme. Phallophore as figured (Fig. 1).

Basiphallus (Fig. 3c) very long and moderately slender, consisting of two rods, both clearly defined, the right rod somewhat stouter than the left. Mesophallus consisting of two small triangular plates which are narrowly separated at their tips where they meet beneath the distiphallus. The distiphallus (Fig. 3b) is more weakly bent than in any other species, its rear part not bent downwards. Distiphallus clearly shorter than the basiphallus.

The ejaculatory bulb (Fig. 3a) is large and scallop-shaped, clearly broader than long. Sometimes the medial channel is visible. Its sclerotisation is moderately strong. Stem short and broad.

Larva. Antennae very small; maxillary palpus large and thick: slender but strong longitudinal sclerite. Narrow mandibular abductor apodeme present. Mandibles (Fig. 39a) rather narrow, with 4 teeth, the lower two smaller; usually an obvious protuberance posteriorly behind the point of attachment of the labial sclerite. 2—3 pairs of inconspicous filaments above the mandibles.

Labial sclerite (Fig. 39b) and paraclypeal phragma slender, but strongly sclerotised. Small antero-dorsal process at base of paraclypeal phragma.

Head without spines. Prothoracic girdle consisting of about 8 rows of minute spines. Mesothoracic girdle present only ventrally, with about 4 irregular rows of spines. Metathorax to 4th abdominal segment with broad bands of large spines pointing postero-dorsally; metathorax with 6—7 rows of spines, 1st to 3rd abdominal segments 8—10 rows, 4th abdominal segment 6 rows; all bands weaker dorsally. 5th abdominal segment with a well developed band at least laterally, with 3—5 rows of spines. Following segments bare laterally, with a few spines ventrally in 2 rows. Also numerous small sharp spines in the anal region.

Front spiracles (Fig. 39c) with 12—16 bulbs, consisting of two almost equal horns on a long somewhat twisting atrium. Hind spiracles (Fig. 39d) contiguous: their bulbs oval-shaped, of moderate size; adjacent bulbs forming an angle of 80°.

Length (full-grown) 3.75—4.5 mm.

Biology. Mine (Fig. 48) on upperside of leaf. Eggs laid singly near the edge of the leaf, usually some distance from the leaf tip. The larva at first makes a narrow linear mine towards the leaf tip, then turns and produces a broad irregular channel, eating towards the base of the leaf. Frass irregularly spaced, in large particles. In fresh mines the zig-zag pattern of the feeding lines is often visible.

Pupation follows either inside or outside the mine: if outside, the puparia adhere to the leaf near the mine. At the Ash Vale locality (Surrey) about 50% of the larvae were observed to pupate in the mine. The colour of the puparia varies from black to red.

There are two or probably often three generations. Adults are found first in

June and continue to early September. Mines from June to October, but especially common in early September.

Material examined. In the author's collection. ♂, 2 ♀ Woodwalton Fen, Hunts., 17—22.VIII.60, ex *Phalaris arundinacea*: emerged 29.VIII, 3.IX, 30.III.61. ♀ Woodwalton Fen, Hunts., 22.VIII.60 ex *Arrhenatherum elatius*: emerged 29.VIII. 3 ♂, 9 ♀, swept from Woodwalton Fen, Hunts., 16—25.VIII.60 (4 preparations made with Woodwalton material). 3 ♂, 3 ♀, Ash Vale, Surrey, 5.IX.53, ex *Phalaris arundinacea*: emerged Sept. 53 and May-July 54. ♂, 6 ♀, Ash Vale, Surrey, 15.VIII.54 ex *Phalaris arundinacea*: emerged August/Sept. 54 and June 55, ♀ swept at Ash Vale, Surrey, 5.IX.53. 10 ♂, 16 ♀, Ash Vale, Surrey, 5.IX.60, ex *Phalaris arundinacea*: emerged March/April 61 (4 preparations made from Ash Vale material). ♂ (with preparation), ♀ Rickmansworth, Herts., ex *Phalaris arundinacea* 17.IX.53: emerged 13.V.54. ♀ Finchley, Middx., 31.VIII.53, ex *Phalaris arundinacea*: emerged 17.XI.

Larval preparations from Ash Vale, Surrey, 5.IX.60 (5 preparations) and Woodwalton Fen, Hunts., 16.VIII.61 and 29.VIII.61 (3 preparations) (all from *Phalaris arundinacea*).

In K. A. Spencer's collection. ♂ (with preparation), Oxford, 2.X.52: emerged 5.V.53 ex *Phalaris arundinacea.*

In the Hendel collection (Vienna). ♀ ex *Hordeum muralis,* Wien. ♀ Prater (Wien). ♂ (with preparation) labelled "T" in red (No data: presumably Vienna. Probably the specimen used by Hendel for his description in Hendel (1931)). ♀ Hortobágy leg. Kertész. ♀, Madara, 928, leg. Santády, VI.30, ♂, Silesia, leg. Kertész. ♀ Südtirol, VIII. ♂ Ebenew, 1.VIII.81, leg. Becker. 3 ♂, 2 ♀, no data (presumably Vienna area). ♂ (with preparation), Montserrat, Spain, col. Strobl. ♂ (with preparation), Böhmerwald, Rachel, 24.VIII.15, leg. Zerny.

In the Groschke collection (Stuttgart). ♀, 3.VII.49, ex *Setaria viridis,* Mecklenburg, Schwaan, Buhr, 63.

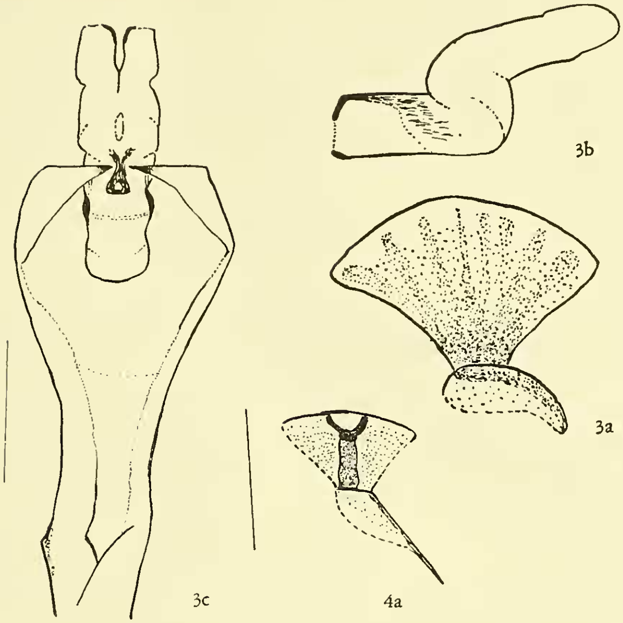
In the Hering collection (Berlin), 2 ♀, ex *Secale cereale*, Mecklenburg, Gr. Lüsewitz 168 & 169, 16.VII.51, leg. Buhr. ♀ ex *Hordeum vulgare*, 16.VII.49, Mecklenburg, Rostock, Buhr, 499. ♂ ♀, ex *Phalaris arundinacea* Grünhof b. Stettin, leg. v. Oethingen. ♀ Mecklenburg, Rostock, Buhr, 16.VII.49 (swept). ♀, ex *Agrostis alba,*, 16.VII.49, Mecklenburg, Rostock, Buhr, 435. ♀, ex *Deschampsia caespitosa*, 16.VII.49, Mecklenburg, Rostock, Buhr, 462. ♀, ex *Phleum pratense*, 9.VII.49, Mecklenburg, Rostock, Buhr, 483. ♂ (with preparation), ex *Poa trivialis*, 8.VII.49, Mecklenburg, Rostock, Buhr, 487. ♂, ex *Poa* sp., 13.VII.49, Mecklenburg, Schwaan, Buhr, 275. ♀, ex *Festuca* sp., 12.VII.49, Mecklenburg, Rostock, Buhr, 402. ♂ (with preparation), ex *Phragmites communis,* Verson b. Caen, 21.VII.42, Buhr, 79. ♂, swept at Berlin, Finkankg. 6.V.29. Also a larval preparation from Lüsewitz, 30.III.32, No. 5884, ex *Phalaris arundinacea.*

In the Rydén collection (Hälsinborg, Sweden). ♀ Äng. 23.VII.33. ♀ Vg. Torpa 22.VI.46. ♂ (with preparation), Gotland, Etelheim, 19.VII.50. ♂ Gotland, 15.VII.50. ♂ (with preparation) Gotland, Bogeviken Slite, 15.VIII.50. 4 ♂, 2 ♀, Närke Mulhytten tf. Lillån, 4—5.VII.52. 2 ♂, 4 ♀, Skåne, Skälderviken, 5.VIII.55. ♀ Skåne, Sköralid, 18.V.48. ♀ Skåne, Bölinge, 16.VI.55. ♀, Kullaborg, 20.VIII.40. ♀, Ängelh., 15.VI.50. ♀, Väster Götland, Ulricehamn, 14.VII.47. ♀ Ängermanland, Docksta, 18.VI.54.

In the Zetterstedt collection (Lund). ♂ (with preparation), type of the synonymous *albo-hyalinata* Zett. from Esperöd. The differences noted by Zetterstedt in his description are due to the specimen having been killed soon after emergence before its colours had set.

There are also accurate records for Holland (de Meijere 1934) and Scotland (Spencer 1956). Sasakawa (in litt.) knows this species from Japan.

Distribution. Great Britain (incl. Scotland), France, Northern Spain, Holland, Sweden, Germany, Austria, North Italy, Hungary, Czechoslovakia, Poland, Japan. Two ♀ from Kamtschatka were referred here by Hendel (1931). I cannot be certain if these are *albipennis.* The matter must rest until a ♂ is obtained.



Figs. 3—4. Male genitalia of *Agromyza*: 3, *albipennis* Meigen sensu stricto; 4, *albipennis fennica* subsp. nov.: a — ejaculatory bulb; b — lateral view of phallus or distiphallus; c — ventral view of phallus

The species is generally common. After the ubiquitous *nigripes* it is the next commonest species to turn up in swept material.

Host plants. Gramineae, tribes Festuceae, Hordeae, Aveneae, Agrosteae, Phalarideae and Paniceae.

The species is always abundant on *Phalaris arundinacea* L. Many of the records from other genera have only been made on one occasion, and many of them may therefore only be occasional foodplants (particularly the record from *Deschampsia* from which *lucida* has been bred many times but *albipennis* and *nigripes* once only). I therefore now give a separate list of the known normal food-plants of this species from those from which it has been bred on one occasion only.

Normal food-plants: Festuceae, *Poa* (bred from *P. trivialis* L. and *Poa* sp.). Hordeae, *Hordeum* (bred from *H. vulgare* L. and *H. murinum* L.). Phalarideae, *Phalaris arundinacea* L. (very common here).

Recorded as food-plants once only: Festuceae, *Festuca* sp. Hordeae, *Secale cereale* L. Aveneae, *Arrhenatherum elatlius* (L.) J. & C. Presl. *Deschampsia caespitosa* (L.) Beauv. Agrosteae, *Agrostis stolonifera* L. (= *alba*) *Phleum pratense* L. Paniceae, *Setaria viridis* Beauv.

There are several references in the British literature (by SPENCER and myself) to this species being bred from *Phragmites*. These are all due to confusion of the food-plant, which was *Phalaris*, not *Phragmites*. There is one male in HERING's collection (listed above) labelled *Phragmites* collected by Dr. Buhr. He cannot however trace the mine from which it was bred, so that I regard this record as doubtful. In any case *Phragmites* cannot be a normal food-plant: observation in this country has shown that where *Phragmites* and *Phalaris* grow together, *albipennis* occurs in profusion on *Phalaris,* but is never found on *Phragmites.*

Records of this species on *Glyceria* are inaccurate and refer to *nigripes.*

Agromyza albipennis Meigen fennica subspec. nov.

Textfigure 4a.

Frons broad, 1.8 times the width of an eye at the level of the front ocellus. Cheeks and jowls clearly visible in profile. Eye small, ratio of eye-height to the height of the jowls 3.0. 3 strong lower orbital bristles.

Wing-veins brown; membrane whitish tinged with fairly obvious pubescence. Squamal fringe dull white. Wing-length 1.8 mm.

Not distinguishable on external characters from small examples of the typical form.

♂ genitalia. Aedeagal apodeme, 9th sternite, postgonites, pregonites and aedeagal hood as for the typical form. Basiphallus consisting of two long rods with an obvious ventral appendage composed of transparent chitin (in typical *albipennis* this is vestigial). Distiphallus as in the typical form: distiphallus and basiphallus of equal length.

The ejaculatory bulb (Fig. 4a) much smaller than in the typical form; much broader than long with a strongly sclerotised central channel which bifurcates at its tip. The stem is very large (contrast the typical form).

Larval stage and biology unknown.

Material examined. In the Hendel collection. Type ♂ (with preparation), Messuby, coll. Frey.

I associate with this specimen 2 ♀ labelled Kuusamo and Kuopio, coll. Frey.

Distribution. Finland.

The genitalia of this subspecies are strikingly distinct from the typical form of *albipennis.* However the external morphology is not incompatible with that of small specimens of *albipennis,* and the distiphallus is of the characteristic *albipennis* type. I have accordingly given the form only subspecific rank.

Agromyza nigripes Meigen 1830 pro parte

Agromyza nigripes Meigen, 1830, pro parte, Syst. Beschr. bekann. eur. zweifl. Insekt., vol. 6, p. 170. (nec Zetterstedt, Schiner, Rondani, Stary pro parte et passim).

Agromyza nigra Zetterstedt, 1840, Ins. Lap., p. 788.

Agromyza carbonaria Zetterstedt, 1848, pro parte. Dipt. Scand., vol. 7, p. 2739, et 1860, loc. cit., vol. 14, p. 6451 (var. b duplo fere minor): etiam Schiner, Bezzi et passim.

Agromyza agrosticola Hering, 1927, Z. angew. Ent., vol. 13, p. 191.

Textfigures 2, 5a, 5b, 5c, 17, 28, 38a, 38b, 38c, 38d, 38e, 49

A fuller account of the synonymy is given by Hendel (1931). There is one small deletion to make. The specimen of *Agr. holosericea* Strobl. nec Bouché is *lucida* Hendel.

Frons of the broader type, 1.2—1.8 times the width of an eye at the level of the front ocellus, parallel-sided. Antennae clearly separated at their bases. In profile (Fig. 17) the cheeks and orbits are usually visible at least narrowly. Ratio of the eye-height to the height of the jowls 3.5—7, though occasionally the jowls are narrower, the ratio being as much as 11. 4 strong orbital bristles (rarely a small 5th), the lower pair usually directed inwards and backwards. 3rd antennal segment slightly broadened apically, rounded at its tip. Colour of head usually completely black; occasionally the frons and first two antennal segments dark brown.

Acrostichals in 6—8 rows. Legs completely black, or the tips of the front femora only yellow.

Ratio of 2nd and 3rd costal segments (Fig. 28) 2.7—3.4; 2nd and 4th 3.3—5. Wing-tip between the ends of r_{4+5} and m_{1+2}, rarely nearer the former. Wing veins brown, membrane obviously brownish tinged. Squamal fringe usually ochreous or brown, but varying from almost black to greyish white (in particular most Scandinavian specimens have a dark-brown to blackish fringe). Wing-length 2.0—2.8 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the end of the aedeagal hood 0.8 mm. Aedeagal apodeme thick, heavily sclerotised, the strengthened part posterior to the attachment of the inner processes of the postgonites occupying $^1/_5$ of the whole apodeme. 9th sternite short and rounded, bearing a narrow hypandrial apodeme which occupies $^1/_5$ of the length of the whole sternite, its tip reaches a little over ½ of the length of the aedeagal apodeme. Pregonites large, postgonites small (Fig. 2). Aedeagal hood moderate-sized, strongly sclerotised around its edges. Phallophore as shown for *albipennis* (Fig. 1).

Basiphallus (Fig. 5c) consisting of two strongly sclerotised rods, the right rod broader than the left. There are small ventral appendages composed of transparent

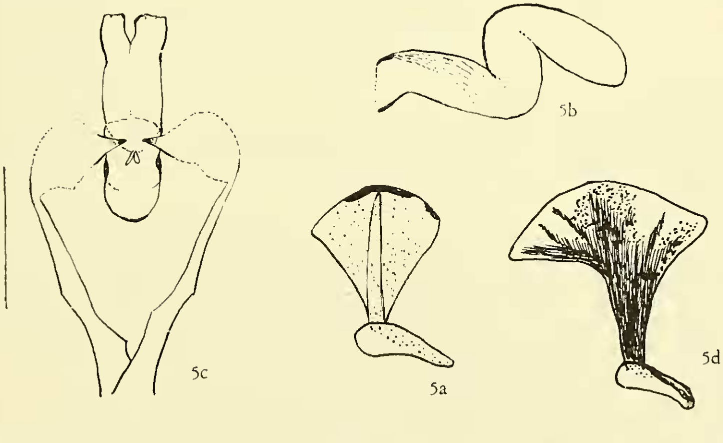
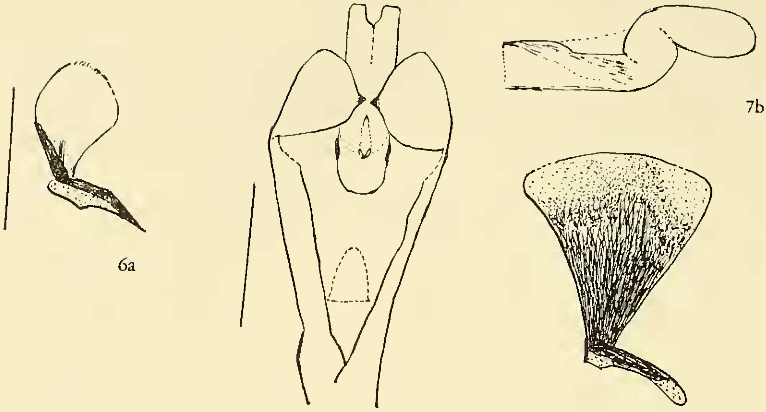


Fig. 5. Male genitalia of *Agromyza nigripes* Meigen s.s.: a — ejaculatory bulb; b — lateral view of distiphallus; c — ventral view of phallus; d — an aberrant ejaculatory bulb shown by one Viennese specimen



Figs. 6—7. Male genitalia of *Agromyza*: 6, *nigripes brachypodii* subsp. nov.; 7, *lucida* Hendel: a — ejaculatory bulb; b — lateral view of distiphallus; c — ventral view of phallus view of phallus

sclerotin. Mesophallus consisting of two plates, coming to a point where they almost meet beneath the distiphallus. Distiphallus (Fig. 5b) with its rear part strongly bent downwards; usually also slightly bent at its tip (compare *hendeli*). Size of distiphallus variable: usually at least slightly longer than the basiphallus, sometimes very much so.

Ejaculatory bulb (Fig. 5a) small and weakly sclerotised; central channel usually clearly visible. Its distal edge characteristically black marked, at least centrally, in most examples. Stem short.

This species shows considerable variation in the colour of the squamal fringe. Generally it is darker in the males, especially from Scandinavia. In large females it may be almost white. Also the phallus is rather variable; many specimens from Central Europe have a very large distiphallus and broader rods to the basiphallus. However intermediates are common, and variation is often very marked even in specimens from the same locality.

One Viennese specimen has a very unusual ejaculatory bulb, but is otherwise normal. This is shown in Fig. 5d. I regard this specimen merely as an aberration of *nigripes*.

Larva. Antennae small; maxillary palpus large and thick; slender longitudinal sclerite only weakly sclerotised. No mandibular abductor apodeme. Mandibles (Fig. 38a) rather narrow, with 4 teeth, the lower two smaller; a protuberance posteriorly beneath the point of attachment of the labial sclerite. 3 pairs of filaments above the mandibles.

Labial sclerite (Fig. 38b) slender and straight. Paraclypeal phragma slender but strongly sclerotised; its dorsal and median processes fused apically; small anterodorsal process at its base.

Head without spines. Prothoracic girdle consisting of about 8 rows of extremely minute spines. Mesothoracic girdle very reduced, consisting only of a patch of small irregular spines ventrally. Methathorax and first five abdominal segments with continuous bands of irregular dorsally and posterodorsally directed spines (Fig. 38c) in 7—9 rows; all spines smaller than in *albipennis*. 6th abdominal segment with a weaker, irregular band of spines in about 5 rows laterally and ventrally; bare dorsally. 7th and 8th segments with about 4 rows of slender pointed spines, mainly ventrally. Also anal region with numerous small pointed spines.

Front spiracles (Fig. 38c) small, with two horns, the anterior being clearly longer than the posterior; 16—20 small bulbs in two rows; atrium long, with several kinks. Hind spiracles (Fig. 38d) separated by 1½—2 times their width; their bulbs oval-shaped, rather widely separated from each other; adjacent bulbs forming an angle of 100°.

Length (full-grown) 3.75—4.5 mm.

Biology. Mine (Fig. 49) on upperside of leaf. Eggs laid singly, usually on the edge of the leaf or near the tip. The narrow early channel of the larva usually swallowed up by its later broader mine. Frass particles fairly conspicuous, irregularly scattered. The mine is deep; on *Glyceria* parts of the lower parenchyma are consumed, but the larva generally does not cross the midrib, forming its mine on one side of the leaf.

Pupation follows outside the mine, the puparia adhering to the leaf near the mine. Puparia usually black, sometimes reddish.

Two generations. Flies in May/June and again in August/early September. First generation of larvae in June, second in late August to September.

Material examined. In the author's collection. ♂ (with preparation) Ash Vale, Surrey, 5.IX.53, ex *Glyceria maxima*: emerged 15.VI.54. 6 ♂ (with 2 preparations), 7 ♀, Ash Vale, Surrey, 5.IX.60, ex *Glyceria maxima*: emerged Sept. 60 and March/April 61. ♀, Beaconsfield, Bucks. 6.IX.53, ex *Holcus lanatus*: emerged 29.IV.54. ♂ 2, ♀, swept at Woodwalton Fen, Hunts., Aug./Sept. 60. 2 ♀, swept from Chippenham Fen, Cambs., 5.VI.55. ♀ swept at Bookham, Surrey, 23.V.54.

Larval preparations from Ash Vale, Surrey, 5.IX.60, ex *Glyceria maxima* (two preparations) and Woodwalton Fen, Hunts., 25.VIII.60, same host.

In K. A. SPENCER's collection. ♀ Chippenham Fen, Cambs., 4.VII.58, ex *Deschampsia caespitosa*: emerged 11.VII.58.

In the HENDEL collection. 2 ♂ (with preparations), ♀, Messuby, Frey. ♂ (with preparation), 2 ♀, Pojo, Frey. 2 ♂ (with preparations), 2 ♀ Karislojo, Frey. ♀, Kuopio, Frey. ♀, Summatti, Frey. 2 ♂ (with 1 preparation), Hammern, Öst. sup., leg. Mik, 6.VIII.83. ♀, Hammern, Öst. sup., 10.IX.72, leg. Mik. ♀, Linz, Öst. inf., 4.VII.67, leg. Mik. ♂ (with preparation), Hainfeld, Öst. inf., 21.VII.97, leg. Mik. 2 ♂ (with preparations), Freistadt, Öst sup., 26.VI.68, leg. Mik. ♂ (with preparation), Baarn, Holland, 14.VI, leg. de Meijere. ♂ Felsöhági, leg. Méhely. ♀, Körösmezö, leg. Kertész, July 1917. ♂ (with preparation), Tisawitz (?), Aug. 1919. ♂ (with preparation), Caltenlichtgeben, Öst. inf. August. 4 ♂ (with preparations), ♀ Ossiach, Kärnten, July/August, leg. Hendel. 2 ♂ (with preparations), Hoheneich, Öst. inf., leg. Zerny. ♂ (with preparation), Almsee, Öst. sup., leg. Czerny. ♂ (with preparation), 2 ♀, Prerbaum, Öst. inf., 1.VI.17. ♂ (with preparation), 2 ♀ Langenzersdorf, Öst. inf. July. 2 ♂ (with preparation), Prater, Wien, May col. Hendel. 6 ♂ (with 4 preparations), 6 ♀ without data, presumably Vienna region, leg. Hendel (including a specimen labelled "T" in red, presumably the specimen used for the description in Hendel (1931)).

In the GROSCHKE collection. 2 ♀, Baienfurt, Württemburg, 19.VI.55, leg. Groschke. ♂ ♀, Stempeda, Harz, 19 & 23.VI.27, Nos. 3161 & 3142, Hering.

In the Hering collection, ♀, Güntersberg an Oder, 5.IX.24, ex *Glyceria maxima*, Hering 2600. ♂ (with preparation), Maribo, Denmark, 4.V.32, ex Glyceria maxima, leg. Sönderup. ♀, Prerow (Darss.), July 1926, ex *Agrostis canina*: emerged 24.VIII, Hering, 2978 (type of the synonymous *agrosticola* Hg.). 4 ♂, ♀, Stempeda, Harz, 19—27.VI.27, Hering, nos. 3141, 3142, 3148, 3161. 2 ♂ (with 1 preparation), Krippen, Sächs. Schweiz, 27.VI.37, leg. Hering.

In the Rydén collection. 4 ♂ (with 1 preparation), 4 ♀, Vg. Ulricehamn, June/July 46—48. ♂ (with preparation), ♀, Bohuslän, Ljungskile, 9 and 11.VIII.51. ♀, Saxnäs, 29.VI.47 leg. Ringdahl. ♀, Sodermanland, Groningen, 14.VI.54. ♀, Ängermanland, Docksta, 18.VI.54. ♀, Råå 5.V.46. 3 ♂, Skåne, Väderön, 7.VII.34, 24.VIII.49 & 30.V.52. ♂, Uppland, Österskär, 12.VIII.48, ♂, Arild, 11.II.25. ♀, Vallbo, 29.VI.35. ♀, Skåne Bästad, 30.V.52. ♂, Mölle, 19.VII.56, leg. Ringdahl. ♂, Skåne, Tyringe, 30.VIII.47. ♂ ♀, Skåne, Kullaborg 20.VIII.49. ♀, Bolmen, 15.VI.54. ♂ ♀, Narke Mulhytton tf. Lillån, 5.VIII.52. 3 ♂ (with one preparation), ♀, Närke, Hjälmarsberg, 6.VIII.52. ♀, Gotland, Västerheide, 27.VI.50. ♂, Ängermanland, Hampnäs, 18.VI.54. ♂, (with preparation), ♀, Norbotten, Vågåmo, 14. VII.53. 4 ♂ (with one preparation), Torne Lappmark, Björkliden, 12 & 17.VII.54, 2 ♂, Torne Lappmark, Abisko-omr., 22—23.VII.54.

There are also accurate records for Scotland (Spencer 1956) and France (Séguy 1934).

Distribution. Great Britain (incl. Scotland), France, Switzerland, Holland, Sweden (including Lappland), Denmark, Germany, Austria, Czechoslovakia, Hungary, Finland.

Several of the distribution records given by Hendel (1931) were based on misidentifications and must be deleted. In particular the Syrian specimen is *A. hiemalis* Becker.

American records of this species (see Frick 1959) need confirmation. Frick describes his *nigripes* as having a white squamal fringe, which is not the case in European *nigripes.*

The species is one of the commonest Agromyzids to appear in the sweep-net in Northern Europe.

Host plants. Gramineae: tribes Glycerieae, Aveneae and Agrosteae. The species is always in abundance on *Glyceria maxima* (Hartm.) Holmb. At the Ash Vale locality I also observed it on *Glyceria fluitans* (L.) R.Br. De Meijere (1925) also took this species on *Holcus mollis* L.

Hering (1957) keys this species under several other genera: *Phalaris* (3668), *Setaria* (4811), *Agropyron* (151), *Alopecurus* (273) and *Hordeum* (2607). Of these the *Phalaris* record is almost certainly incorrect: according to my observation in this country *nigripes* occurs freely on *Glyceria* but never on *Phalaris* when the plants grow together. Some of the other records are probably correct but they cannot be accepted without confirmation as they are not based upon bred material, and considerable confusion has hitherto reigned over the larval characters of this group. The following list of known food-plants will no doubt be enlarged in the future, considering the ease with which *nigripes* is swept.

Normal food-plants: Glycerieae; *Glyceria maxima* (Hartm.) Holmb.; *G. fluitans* (L.) R.Br. Aveneae: *Holcus* (recorded from *H. lanatus* L. and *H. mollis* L.) Recorded as food-plants once only: Aveneae: *Deschampsia caespitosa* (L.) Beauv.; Agrosteae: *Agrostis canina* L. Old records of this species on *Phragmites* refer to *hendeli* (described below).

One form of *nigripes* appears to merit subspecific rank.

Agromyza nigripes Meigen brachypodii subspec. nov.

Agromyza albipennis Buhr (nec Meigen), 1941. Stettin. ent. Ztg., vol. 102, p. 90. Syn. nov.

Textfigure 6a

Identical on external characters with small specimens of the typical form. Squamal fringe ochreous. Small size characteristic; wing-length ♂ 1.8 mm, ♀ 2.2 mm.

♂ genitalia. Aedeagal apodeme, 9th sternite, postgonites, pregonites and aedeagal hood as for the typical form. Basiphallus consisting of two broad but fairly ill-defined rods, with small ventral appendages (as in the typical form). Mesophallus poorly sclerotised except at its outer edges. Distiphallus fairly small, about as long as the basiphallus.

The ejaculatory bulb (Fig. 6a) is small, evenly rounded, transparent except for a contrasting black patch on one side near its base. Stem strongly sclerotised and fairly long.

Larva. Unknown.

Biology. BUHR (1941) states that puparia were found in a large communal blotch-mine on 7.IX.30. Pupation is thus in the mine (in contrast with the typical form). The mine specimens are unfortunately not extant.

Material examined. In the HERING collection. Type ♂ (with preparation) Sagone, Corsica ex *Brachypodium sylvaticum*, leg. Buhr: emerged 17.IX.30. Allotype ♀ same data, emerged 15.IX.30. Paratype ♂ (with preparation) same data, emerged 16.IX.30.

I erect this subspecies on account of the distinct ejaculatory bulb (not paralleled in 38 preparations of the typical form from numerous localities) and the unusual food-plant. *Brachypodium* is an easily recognised grass, and can be said with reasonable certainty not to be attacked by *Agromyza* spp. in this country. The combination of these two facts with the unusual locality makes it probable that we are dealing with a case of geographical variation. It will be interesting if further material can be obtained from the Mediterranean region.

Distribution. Corsica.

Host plant. *Brachypodium sylvaticum* (Huds.) Beauv.

Agromyza lucida Hendel 1920

Agromyza lucida Hendel, 1920, Arch. Naturgesch., vol. 84, part A, fasc. 7, p. 121. (as subspecies of *Agromyza reptans* Fallén (1823)) (nec Hendel, 1922. Wien. ent. Ztg., vol. 39, p. 66, et 1931. Flieg. pal. Reg., vol. 59, p. 129: nec passim apud Hering, de Meijere et alibi).

Agromyza holosericea Strobl (nec Bouché) 1893 Wien. ent. Ztg., vol. 12, p. 135, et alibi. Syn. nov.

Agromyza airae Karl, 1926, Stettin. ent. Ztg., vol. 87, p. 138: etiam Hering, de Meijere et passim.

Agromyza nigripes Stary (nec Meigen), 1930, pro parte. Acta Soc. Sci. nat. Morav., vol. 6, p. 143. Syn. nov.

Textfigures 7a, 7b, 7c, 18, 29, 40a, 40b, 40c, 40d, 50.

Agr. holosericea Strobl. (nec Bouché) is synonymised as a result of my examination of the specimen in Hendel's collection, thus determined in Strobl's handwriting. Stary's *"nigripes"* on *Glyceria* is clearly *lucida* as shown by his figure of the larval mouthparts.

The type of *A. lucida* Hendel is mounted on a long fragile pin rendering examination hazardous. It is a freshly emerged specimen whose colours are not properly developed (as noted by Hendel, 1931). Its specific identity is however quite clear. The name *lucida* cannot be retained for the *Phragmites*-feeding species, which is redescribed below as *hendeli.* The type was obviously not used for Hendel's description in 1931 (naturally enough in view of the fragile mount), and the description given applies to the species described below as *hendeli,* not the original *lucida.* Consequently most subsequent authors have applied the name *lucida* to the wrong species.

Frons usually broad, though sometimes approaching the narrow type, 1.0—1.5 times the width of an eye at the level of the front ocellus: parallel-sided or narrowing forwards. Antennae usually clearly separated at their bases. In profile (Fig. 18) the orbits narrowly visible, the cheeks usually not so. Eyes large, slightly pubescent. Jowls narrow: ratio of the eye-height to the height of the jowls 5—13. Facial keel only slightly protruding in profile. 4 or 5 strong orbital bristles: lower orbitals directed either backwards or inwards. 3rd antennal segment small and rounded: antennal pubescence rather coarse. Frons dark-brown, sometimes yellow-brown centrally. First two antennal segments usually brown or yellow-brown.

Acrostichals in 8—9 rows. Legs of variable colour: usually at least the front legs with yellow tips to the femora, brown tibiae and yellowish tarsi. Sometimes also the other tarsi brown and pale tips to all the femora.

Ratio of 2nd and 3rd costal segments (Fig. 29) 1.6—3; 2nd and 4th 2.7—4. Wing-tip usually nearer the end of r_{4+5} than m_{1+2}. Wing-veins brown: membrane clear or slightly brownish tinged. Squama white, grey or ochreous, usually ochreous on its margin, with a thick black or dark brown fringe. Wing-length 2.2—3.0 mm.

One of the largest species in the group.

♂ genitalia. Distance from the tip of the aedeagal apodeme to the end of the aedeagal hood 1 mm. Aedeagal apodeme more or less straight, the strengthened part posterior to the attachment of the inner process of the postgonites occupying rather more than $^1/_5$ of the whole apodeme. 9th sternite fairly slender, somewhat less rounded than in *nigripes* (compare Fig. 2), strongly bent downwards towards its tip: short hypandrial apodeme, its tip reaching almost $^2/_3$ of the length of the aedeagal apodeme. Pregonites smaller than in *nigripes* (compare Fig. 2): postgonites a little larger, more quadrate. The aedeagal hood projects further forward than that of *albipennis* (compare Fig. 1), and is fairly weakly sclerotised. Phallophore as figured for *albipennis* (Fig. 1) but relatively longer.

Basiphallus (Fig. 7c) consisting of two short, fairly broad rods, the right being a little broader than the left. A pale wedge-shaped sclerite lies in the membrane beneath the basiphallus. Mesophallus consisting of two large elliptic plates, which almost meet beneath the distiphallus. Distiphallus (Fig. 7b) fairly long, being about as long as the basiphallus or clearly longer than it. Tensile membrane across the top of the distiphallus slightly sclerotised.

Ejaculatory bulb (Fig. 7a) large and strongly sclerotised, often almost completely black: about as broad as long. Stem short and curved, also strongly sclerotised.

Larva. Antennae small: maxillary palpus large and thick: slender but strong longitudinal sclerite. Narrow mandibular abductor apodeme present. Mandibles (Fig. 40a) long, with three teeth, the lower one being smaller than the upper two: usually a slight protuberance posteriorly below the point of attachment of the labial sclerite. 2—3 pairs of filaments above the mandibles.

Labial sclerite (Fig. 40b) long, its lower edge curved: paraclypeal phragma more strongly sclerotised basally than apically; the ventral process is heavily sclerotised for half its length: antero-dorsal process weak.

Head without spines. Prothoracic girdle consisting of about 10 rows of minute spines: stronger ventrally. Mesothoracic girdle absent. Metathoracic girdle with about 10 rows of small spines laterally; about 2 rows dorsally and ventrally. Abdomen with more numerous spines than in other species: these are small but sharply pointed: rather irregular but mostly pointing dorsally or postero-dorsally. All bands at their broadest laterally, weaker ventrally: dorsal edge almost bare. 1st segment with 16—20 rows of spines: 2nd to 5th segments with 14—16 rows: 6th with 10—12 rows: 7th with 7—8 rows (laterally only): 8th with 5—6 weak rows (laterally only). Also numerous spines in the anal region.

Front spiracles (Fig. 40c) small, on a short twisting atrium, with 12—14 small bulbs: the anterior horn slightly larger than the posterior. Hind spiracles (Fig. 40d) separated by 1½—2 times their own width; their bulbs elongate-oval, rather widely separated from each other: adjacent bulbs forming an angle of 90°. Atrium similar to that of the front spiracles.

Length (full-grown) 4.5—5.5 mm.

Biology. Mine (Fig. 50) on upperside of leaf. Eggs laid singly on the edge of the leaf, usually near the leaf-tip. The larva at first eats towards the leaf-tip, but soon turns and produces a broad shallow blotch, on *Deschampsia* occupying the whole leaf-breadth. Frass particles fine and inconspicuous. The mine is shallow and the lower parenchyma is left untouched (contrast, *nigripes*). The larva crosses the midrib freely. On *Glyceria* several eggs are often laid on one leaf and the resulting mines coalesce to consume the whole leaf.

Pupation follows outside the mine, the puparia adhering to the leaf near the mine. Puparia black or dark red.

Two generations. Flies occur in June and again in August. First generation larvae found in June/July; second generation larvae in September/October (later than *nigripes*).

Material examined. In the HENDEL collection. Type ♀, Öst. sup., Altsee 26.VIII, leg. Czerny (swept). ♀ Stolp i. P., 10.II.26, ex *Deschampsia caespitosa* leg. Karl. ♀ Kartashevka, Petrograd 2.VII.26, leg. Stackelberg. ♂ (with preparation) ♀, Alte Sammlung, Klostenenburg. ♀ "*Agr. carbonaria* Zett. B *holosericea* Bouché" det. Strobl. ♀, no data (presumably Vienna region).

In the author's collection. 3 ♂ (with 1 preparation), 4 ♀ Ash Vale, Surrey, 5.IX.60, ex *Glyceria maxima*: emerged Oct. 60 and March/April 61. 4 larval preparations, Ash Vale, Surrey, 5.IX.60 ex *Glyceria maxima*.

In the GROSCHKE collection. ♂ (with preparation) Soritz, Beutzen, 28.VII.27, ex *Deschampsia caespitosa* leg. Schülze. ♀ Mecklenburg, Rostock, 16.VII.49, ex *Deschampsia caespitosa*, no. 462, Buhr.

In the HERING collection. ♂ paratype of the synonymous *airae* Karl (with preparation) ex *Deschampsia caespitosa*. ♀ Chippenham Fen, Cambs., emerged 22.VII.58, ex *Deschampsia caespitosa*, Hering, 6317. 2 ♀ Soritz, Beutzen 17.VII.27, ex *Deschampsia caespitosa*, leg. Schütze. ♀ Mecklenburg, Rostock, ex *Deschampsia caespitosa*, no. 479, Buhr. ♂ (with preparation), Mecklenburg, Rostock, 25.VII.31, ex *Echinaria capitata*, leg. Buhr. ♀ Crossen-an-Oder, 7.V.30, ex *Glyceria maxima* Hering, 3598. ♀ swept at Stempeda, Harz, 25.VI.27, Hering, 3179.

In the NOWAKOWSKI collection (Warsaw). ♂ 16.I.16, ex *Deschampsia caespitosa*, leg. Karl.

In the RYÉN collection (Hälsinborg, Sweden). 2 ♀ Västergötland, Ulricehamn, 27.VI.47. ♂ Docksta, Ångermanland.

In addition to these records DE MEIJERE (1943) knew this species from Holland, and STARY figures the larva from Czechoslovakia.

Distribution. England, Holland, Sweden, Germany, Austria, Czechoslovakia, Poland, Russia. Not uncommon where its host-plants grow: turns up sparingly in swept material.

Host plants. Gramineae: Tribes Glycerieae, Festuceae and Aveneae. Normal food-plants: Glycerieae; *Glyceria maxima* (Hartm.) Holmb. Aveneae: *Dschampsia caespitosa* (L.) Reauv. Recorded as food-plant once only: Festuceae: *Echinaria capitata.*

HERING (1957) also keys this species under *Agropyron* (150), *Bromus* (955) and *Holcus* (2588). I regard these records as requiring confirmation, as they are not based upon bred material.

Agromyza hendeli sp. nov.

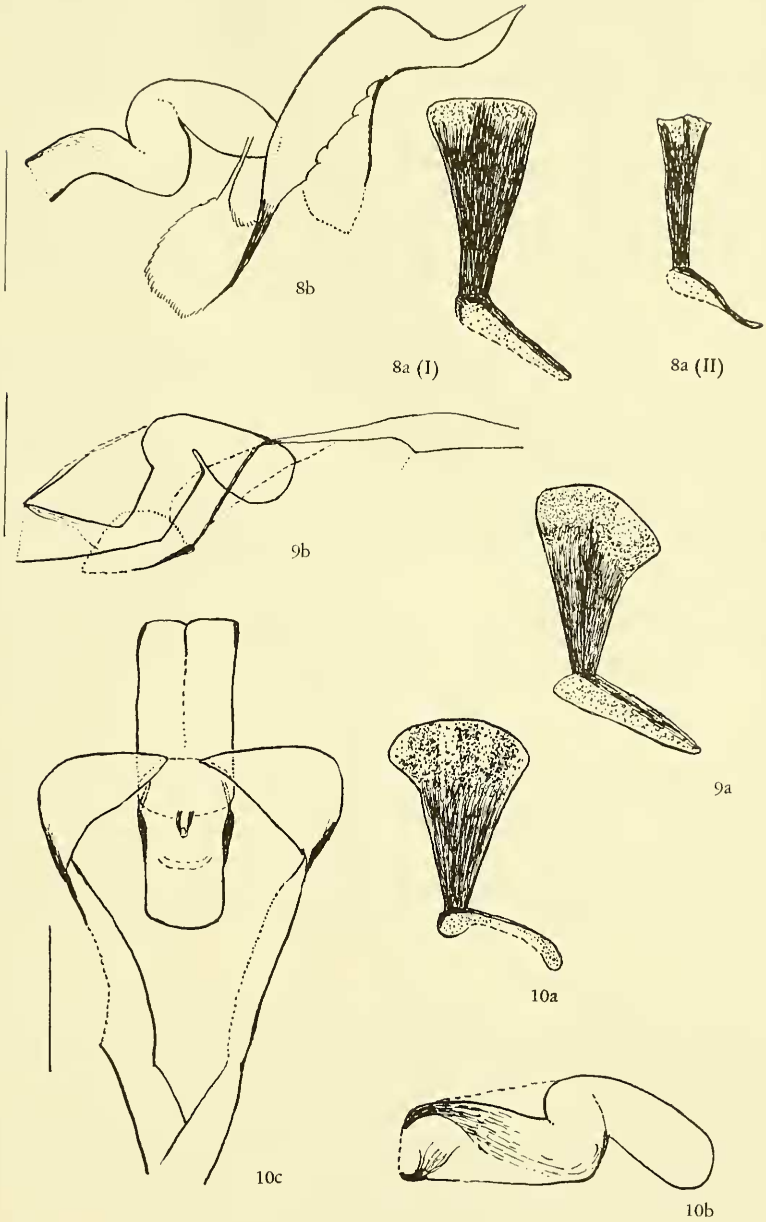
Agromyza nigripes Kaltenbach (nec Meigen), 1856, Verh. naturh. Ver. preuss. Rheinl. & Westph., vol. 13, p. 242, et 1874, Die Pflanzenfeinde aus der Klasse der Insekten, p. 764: etiam de Meijere pro parte, Hering pro parte et passim.

Agromyza lucida Hendel 1922 (nec Hendel 1920), Wien. ent. Ztg., vol. 39, p. 66, et 1931, Flieg. pal. Reg., vol. 59, p. 129: etiam passim apud Hering, de Meijere et alibi.

Textfigures 8a(i), 8a(ii), 8b, 19, 30, 41a, 41b, 41c, 41d

Examination of the type of *lucida* shows that the name can no longer be used for this species. A new name is required although the species has been known for over a hundred years.

Frons narrow, 0.8—1.2 times the width of an eye at the level of the front ocellus; narrowing somewhat forwards. Antennae practically touching at their bases. In profile (Fig. 19) the cheeks usually not visible except very narrowly beneath the eye. Orbits barely visible. Eyes large, faintly pubescent; their height 4—8 times the height of the jowls. 5—6 strong orbital bristles, all directed more or less posteriorly: no clear distinction between upper and lower orbitals. Third



Figs. 8—10. Male genitalia of *Agromyza*: 8, *hendeli* sp. nov.; 9, *spenceri* sp. nov.; 10, *phragmitidis* Hendel: a — ejaculatory bulb; b — lateral view of phallus or distiphallus; c — ventral view of phallus

antennal segment large, broadened apically, somewhat deeper than in *nigripes*. The row of hairs on the second segment strongly developed. Peristomal hairs often longer and more numerous than usual; bristles at the end of the palp strongly developed. Usually the 1st and 2nd antennal segments and the frons are brown, though sometimes the head is completely black.

Acrostichals in 6—9 rows. Legs with usually at least the front femora yellow at their tips; sometimes the tips of all femora yellow and the front tarsi brown.

Ratio of 2nd and 3rd costal segments (Fig. 30) 2.5—3; 2nd and 4th 3.5—4.8. Wing-tip between the ends of r_{4+5} and m_{1+2} or nearer the latter. Veins usually pale (compare *albipennis*): membrane clear. Squama white, with a contrasting black or dark brown fringe. Wing-length 2.0—2.6 mm.

♂ genitalia. Distance from the tip of the aedeagal apodeme to the end of the aedeagal hood about 1 mm. Aedeagal apodeme almost straight; strongly strengthened posterior to the attachment of the inner processes of the postgonites, this part occupying $^1/_5$ of the whole apodeme. 9th sternite small, rather rounded, with a well-defined hypandrial apodeme occupying $^1/_5$ of the total length of the 9th sternite: its tip reaches only to $^1/_2$ of the length of the aedeagal apodeme. Pregonites smaller than those figured for *nigripes* (Fig. 2): postgonites more squarely shaped. Aedeagal hood very large, but weakly sclerotised, in profile clearly raised above the level of the aedeagal apodeme. Phallophore less indented posteriorly when viewed in profile than that figured for *albipennis* (Fig. 1).

Basiphallus consisting of two broad rods, dentate on their lower edge with additional appendages ventrally (Fig. 8b). These are larger than in other species (e.g., *nigripes*) and at least partially composed of dark sclerotin: particularly the posterior edge is clearly defined. Mesophallus consisting of a pair of ill-defined lobes, strongly sclerotised on their outer edges (in profile this gives the impression of a second pair of appendages from the basiphallus). Distiphallus with its rear part strongly bent downwards; also the tip obviously bent down (more markedly so than in *nigripes*). Distiphallus about equal in length to the basiphallus.

Ejaculatory bulb (Figs. 8a(i), 8a(ii) strongly sclerotised, appearing black or dark brown; very narrow, at least twice as long as broad. Stem long, more or less straight.

Larva. Antennae small; maxillary palpus fairly large: slender longitudinal sclerite. Narrow mandibular abductor apodeme present. Mandibles (Fig. 41a) large and powerful with two teeth. Smal mandibular adductor apodeme present. 2—3 pairs of inconspicuous filaments above the mandibles.

Labial sclerite (Fig. 41b) somewhat curved, especially on its lower edge: paraclypeal phragma with its processes composed of brown and black sclerotin (contrast *phragmitidis*): antero-dorsal process very small.

Head with a few small scattered spines below the mandibles, otherwise bare. Prothoracic girdle consisting of about 8—10 rows of minute spines; mesothoracic girdle absent, or at most a few spines in two rows dorsally. Metathorax and first five abdominal segments with strong bands of large spines; in each band the posterior 3 or 4 rows consist of larger spines pointing more or less posteriorly; the other spines point generally dorsally or postero-dorsally; bands weakening dorsally and ventrally, the dorsal edge of the abdomen being quite bare, the ventral nearly so. Metathorax with about 8 rows of spines; 1st to 4th abdominal segments with 10—14 rows; 5th with about 8 rows; 6th to 8th segments with some scattered rather blunt spines laterally in 3—4 rows, but these bands very inconspicuous by comparison with those of the preceding segments. Also the anal region with some spines.

Front spiracles (Fig. 41c) small, with two almost equal horns bearing 10—12 small bulbs: atrium relatively short, evenly curved but not twisted. Hind spiracles (Fig. 41d) separated by their own width or a little more: their bulbs elongate-oval, almost touching each other centrally; adjacent bulbs forming an angle of 60°.

Length (full-grown) 3.75—4.5 mm.

Biology. Mine (compare Fig. 51) on upperside of leaf. Eggs laid usually in a row of 3 or 4. The resulting larvae produce a communal mine, at first eating towards the leaf-tip in a gradually broadening communal channel. In the third instar the larvae often split up producing a large irregular blotch, often too there are several egg-groups on the same leaf, and the resulting mines coalesce. Frass in large scattered particles; zig-zag feeding lines often visible in fresh mines.

Pupation follows normally outside the mine, the puparia adhering to the leaf near the mine. Puparia black or brown.

Two generations. The larvae have been found in June and August: the second generation is earlier than that of *phragmitidis*. Flies have been swept from June to August.

Material examined. In the HENDEL collection. Type ♂ with preparation), Grünwald, emerged 21.III.20, ex *Phragmites communis,* leg. Hering, 1331. Allotype ♀, Bredow b. Nauen, emerged 9.IV.23 ex *Phragmites communis,* leg. Hering, 2154. Paratypes ♀, Wien, 19.VII.78, leg. Mik. ♂, no. data leg. Bgst.

In the author's collection. Paratypes. 2 ♂ (with preparations), swept at Woodwalton Fen, Hunts., 21 & 25.VIII.60. 2 ♀, Woodwalton Fen, Hunts., 16.VIII.60, ex *Phragmites communis*: emerged 12.IX.60. 5 larval preparations from Woodwalton Fen, Hunts., 10.VIII.60, 22.VIII.60 and 21.VI.61.

In K. A. SPENCER's collection. Paratype ♂ (with preparation), Lake Garda, Italy, 25.X.56, ex *Phragmites communis*: emerged 10.III.57.

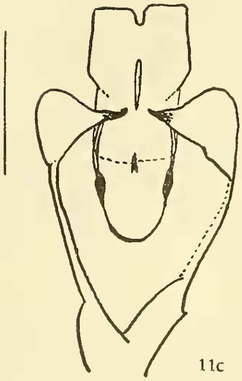
In the GROSCHKE collection. Paratypes: ♂, Bredow b. Nasar, 12.IV.23, ex *Pragmites communis*, Hering, No. 2154. ♂ ♀, Baienfurt, Wttbg. (Fuchsenloch), 17.VI.55, leg. Groschke. ♂, Mecklenburg, Mönkweden, 1.IV.50, ex *Phragmites communis*, Buhr 600/49.

In the HERING collection. Paratypes: ♂ (with preparation), Soritz, Beutzen, 15.VIII.27, ex *Phragmites communis*, leg. Schütze. ♀, Soritz, Beutzen Spring, '28, ex *Phragmites communis*, leg. Schütze. 2 ♀, Berlin, Botanische Garten, 16.VII, ex *Phargmites communis*, no. 58, Hering 1951. ♀ (with preparation), Grünewald, April 1930, ex *Phragmites communis*, 1331, Hering. Also a larval preparation ex *Phragmites communis,* Berlin, Bot. Gart., 18.VI. 57.

In the NOWAKOWSKI collection. Paratype ♂, Puzcza Kampinoska, Mfokiny, 29.VI.57; puparium 1.VII, imago 11.VII, ex *Phragmites communis*, Caricetum, leg. Nowakowski, Inst. Zool. P.A.N., Warszawa, No. 20/57.

In the RYDÉN collection. Paratypes: 3 ♂ (with 1 preparation), 2 ♀, Skåne, Landskrone, 7.VI.50 and 15.VIII.52.

(22 paratypes in all.)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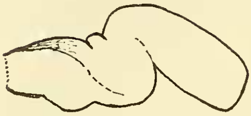
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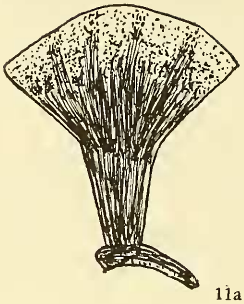
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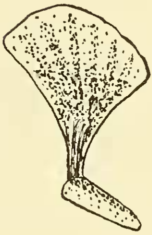
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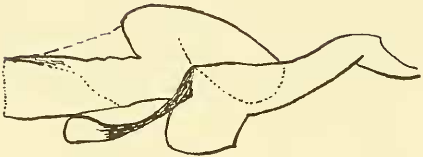
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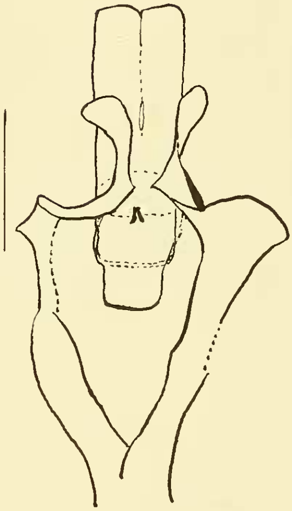
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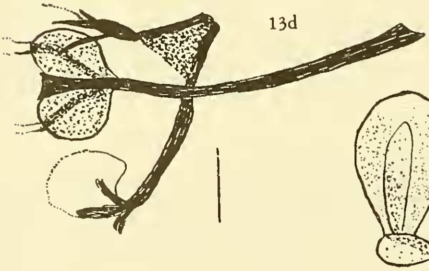
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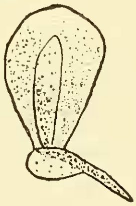
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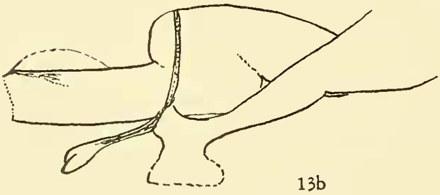
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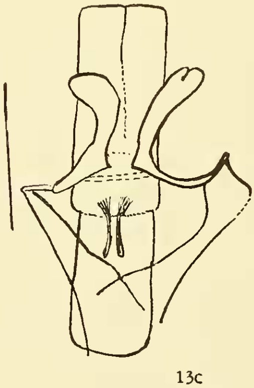

13c

In addition to the above records DE MEIJERE knew this species from Holland and SPENCER (1956) records it (as *lucida*) from Scotland. There are many other references to the mines of this species having been observed (as *nigripes* and *lucida*): however only records resulting from bred material can be trusted as the mines of *hendeli, spenceri* (described below) and *phragmitidis* are not distinguishable, and the larval characters have been hitherto confused.

Distribution. Great Britain (incl. Scotland), Holland, Sweden, Germany, Austria, North Italy, Poland. Common in northern Europe where its host occurs.
Host plant: *Phragmites communis* Trin.

Agromyza spenceri sp. nov.

Textfigures 9a, 9b, 20, 31, 43a, 43b, 43d

Frons narrow, 1—1.2 times the width of an eye at the level of the front ocellus, strongly narrowing forwards. Antennae practically touching at their bases. In profile (Fig. 20) the cheeks not visible, the orbits barely so. Eyes large, faintly pubescent, their height 6—8 times the height of the jowls. Face-line very flattened in profile. 4 strong orbital bristles, all directed more or less backwards. Third antennal segment small and rounded (compare *phragmitidis*). Frons and first two antennal segments brown: head otherwise black.

Acrostichals in 8 rows. Legs with the front femora broadly yellow at their tips, the others narrowly so. Front tarsi yellow. Legs otherwise dark brown.

Ratio of 2nd and 3rd costal segments (Fig. 31) 2.5—3: 2nd and 4th 4—4.2 (contrast *lucida*). Wing-tip between the ends of r_{4+5} and m_{1+2}. Wing veins brown: membrane brownish tinged. Squama white with an ochreous margin and strong jet-black fringe. Wing-length 2.2—2.6 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the end of the aedeagal hood 0.8 mm. Aedeagal apodeme stout, almost straight: the strengthened part posterior to the attachment of the inner processes of the postgonites occupying $^1/_5$ of the whole. 9th sternite stout, broad and rounded, bearing a well-defined hypandrial apodeme: this occupies about $^1/_4$ of the total length of the 9th sternite: its tip reaches $^3/_5$ of the length of the aedeagal apodeme. Pregonites large, as figured for *nigripes* (Fig. 2), but forming a rounded lobe on their inner anterior corners. Postgonites as figured for *nigripes* (Fig. 2). Aedeagal hood strongly sclerotised at its edges. Phallophore as shown for *albipennis* (Fig. 1).

The sclerotisation of the basiphallus and mesophallus is weak and ill-defined. Basiphallus short and slender, though its right rod slightly broader than its left. Mesophallus very faintly sclerotised except on its outer edge, forming a large ill-defined lobe beneath the distiphallus. The distiphallus (Fig. 9b) is very large and of characteristic shape, being elongated in its central part: the membrane stretching across the top of the distiphallus is partially sclerotised along its edge. Distiphallus about $1^1/_2$ times as long as the basiphallus.

Figs. 11—13. Male genitalia of *Agromyza*: 11. *prespana* Spencer; 12, *graminicola* Hendel; 13, *baetica* sp. nov. a — ejaculatory bulb; b — lateral view of phallus or distiphallus; c — ventral view of phallus; d — aedeagal apodeme and 9th sternite in ventral view

Ejaculatory bulb (Fig. 9a) narrow, moderately sclerotised in its basal $^2/_3$, more weakly so in its distal $^1/_3$: faint medial streak visible. Stem straight.

Larva. There are no extant larval specimens. However the following characters have been described from the puparia. Mandibles (Fig. 43a) with 2 strong teeth (as in *hendeli* and *phragmitidis*). Labial sclerite (Fig. 43b) very long: processes of the paraclypeal phragma consisting of brown sclerotin. Hind spiracles (Fig. 43d) separated by a little over their own width: adjacent bulbs forming an angle of 70°.

As far as these characters go the larvae cannot yet be distinguished from those of *hendeli*.

Biology. The mines are identical with those of *hendeli* and *phragmitidis* (compare Fig. 51): the description under those species applies here also.

The puparia are reddish brown and are attached to the leaf near the mine.

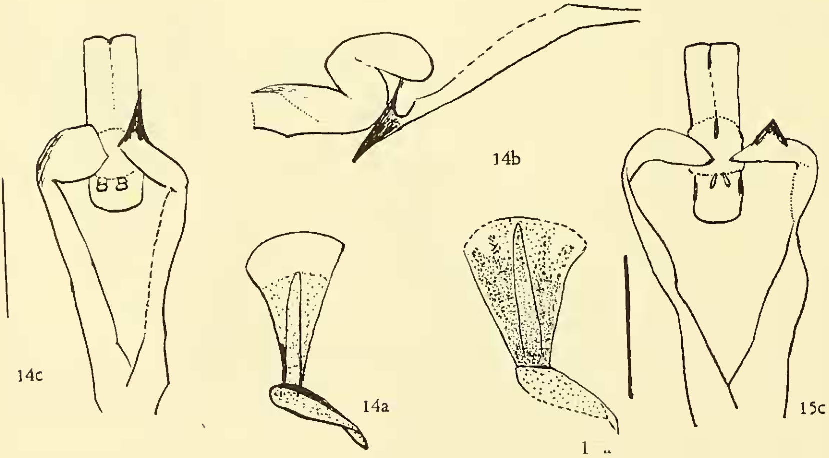
Probably only one generation, as larvae taken in late July did not produce flies until the following year.

Material examined.

In K. A. Spencer's collection. Type ♂ (with preparation) collected on 26.VII. 54, at a small lake between Briançon and Argentières, Basses Alpes, France, at an elevation of about 3,100 ft. (946 metres): ex *Phragmites communis*; emerged 26.VI.55. Paratypes: 2 ♂ and 3 ♀, same data, emerged 23—29.IV.55.

Distribution. French Alps.

Host plant. *Phragmites communis* Trin.



Figs. 14—15. Male genitalia of *Agromyza*. 14, *distorta* Griffiths; 15, *oryzae* (Munakata). a — ejaculatory bulb; b — lateral view of phallus; c — ventral view of phallus

Agromyza phragmitidis Hendel 1922

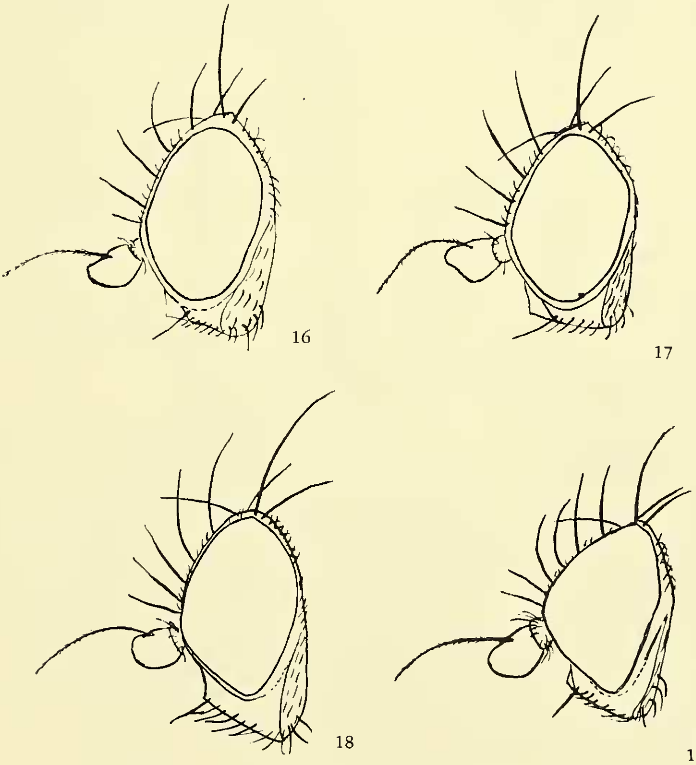
Agromyza phragmitidis Hendel, 1922, Wien. ent. Ztg., vol. 39, p. 65.

Textfigures 10a, 10b, 10c, 21, 32, 42a, 42b, 42c, 42d, 51

Frons narrow, 0.8—1.2 times the width of an eye at the level of the front ocellus: narrowing forwards: the antennae practically touching at their bases. In profile (Fig. 21) the cheeks not visible, and the orbits not or barely so. Eyes very large, slightly pubescent. Jowls normally extremely narrow: ratio of eye-height to the height of the jowls 5—11 (in one specimen the jowls are almost eliminated). 5 weak orbital bristles, normally clearly divided into 2 upper orbitals and 3 lower, the latter nearer to each other than the former: often the orbitals are rather small and adpressed to the frons. 3rd antennal segment small and rounded. Frons, orbits and first two antennal segments clearly brown, sometimes yellow-brown. Arista yellow basally.

Acrostichals 8-rowed. Legs with the tips of all the femora clearly yellow, the front femora more broadly so. All tarsi at least brown, often clearly yellow.

Ratio of 2nd and 3rd costal segments (Fig. 32) 2.5—3.2; 2nd and 4th 3.5—4.5. Wing-tip just after the end of r_{4+5}. Costa often weak between r_{4+5} and m_{1+2}.



Figs. 16—19. Heads in profile of *Agromyza*: 16, *albipennis* Meigen; 17, *nigripes* Meigen; 18, *lucida* Hendel; 19, *hendeli* sp. nov.

Wing-veins pale: membrane clear or whitish. Squama white with a white fringe. Wing-length 2.2—2.8 mm.

A large species. The basic colour of the whole body is sometimes dark brown, not black.

♂ genitalia. Distance from the end of the aedeagal apodeme to the end of the aedeagal hood a little over 1 mm. Aedeagal apodeme more or less straight: the strengthened part posterior to the attachment of the inner processes of the postgonites occupying nearly $^1/_4$ of the whole apodeme. 9th sternite long and narrow, more or less straight-sided in dorsal view; in lateral view obviously bent downwards towards its tip. Hypandrial apodeme large, but not clearly differentiated, being continuous with the rest of the 9th sternite: it occupies about $^1/_3$ of the total length of the sternite: its tip reaches $^2/_3$ of the length of the aedeagal apodeme. Pregonites much smaller than those figured for *nigripes* (Fig. 2): postgonites as figured. Aedeagal hood large, weakly sclerotised, clearly raised above the level of the aedeagal apodeme in profile (compare *hendeli*). Phallophore forming a short double ridge in dorsal view, lacking the indentation shown posteriorly in *albipennis* (Fig. 1).

Basiphallus (Fig. 10c) consisting of two long clearly defined rods of moderate width. Mesophallus consisting of two triangular plates which draw together beneath the distiphallus. Distiphallus (Fig. 10b) large and thick: its rear part bent downwards: a little longer than the basiphallus.

Ejaculatory bulb (Fig. 10a) narrow (but not so narrow as in *hendeli*), strongly sclerotised, appearing black or brown. Its stem long, somewhat curved.

Larva. Antennae small: maxillary palpus large, long: longitudinal sclerite strongly developed. Mandibular abductor apodeme weak, barely visible. Mandibles (Fig. 42a) large and powerful with two teeth. Sometimes a small mandibular adductor apodeme present. 3 pairs of long filaments above the mandibles: these clearly reaching beyond the mandibular teeth.

Labial sclerite (Fig. 42b) long, slightly curved: paraclypeal phragma strongly sclerotised only at its base: all three processes consisting of transparent sclerotin: the ventral process is open at its tip: end of the dorsal process clearly separated from the medial process: antero-dorsal process vestigial.

Head bare apart from 2 or 3 small spines beneath the mandibles. Prothoracic girdle consisting of about 12 rows of minute spines. Mesothoracic girdle absent, or only a small patch of spines present ventrally. Metathorax and first four abdominal segments with strong bands of large spines: in each band the posterior 3—4 rows consist of larger spines pointing more or less posteriorly: the other spines pointing dorsally or posterodorsally. Bands weakening dorsally and ventrally: the dorsal edge of the abdomen almost completely bare: only the bands of the first two abdominal segments continue over the ventral edge. Metathorax with 8—10 rows of spines: 1st and 2nd abdominal segments with 10—12: 3rd segment with 8—10 rows: 4th with 6—8 rows: 5th segment with a very weak band of spines present only laterally in about 4 rows: 6th and 7th segment without bands: 8th segment band represented by a few spines ventrally: also a few spines in the anal region.

Front spiracles (Fig. 42c) fairly small, two-horned, the anterior horn being slightly longer than the posterior: they bear 10—12 bulbs: atrium somewhat twisted. Hind spiracles (Fig. 42d) separated by about their own width: their bulbs elongate-oval, almost touching each other centrally: adjacent bulbs forming an angle of 60°—70°.

Length (full-grown) 4.5—6 mm.

Biology. The mines (Fig. 51) are identical with those of *hendeli*; the description given under that species applies here also. Pupation follows normally outside the mine: the puparia adhere to the leaf near the mine. Puparia very variable in colour, ranging from black to almost yellow.

Two generations. The larvae are particularly common in late September and October. Adults have been swept in May/June and again in September. The autumn generation is later than that of *hendeli*.

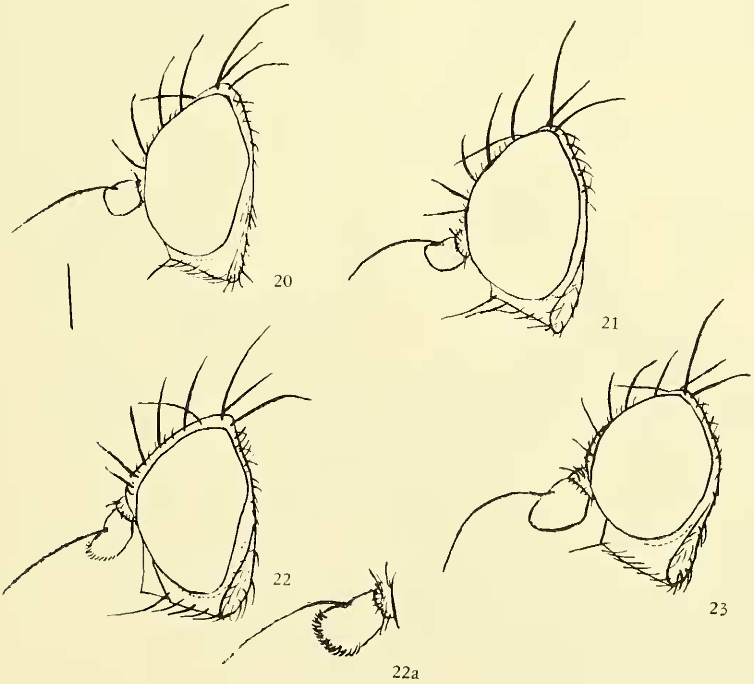
Material examined. In the HENDEL collection. Types ♂ ♀ (both on the same mount), Güntersberg-an-Oder, 6.III.29, ex *Phragmites communis*, leg. Hering.

2 ♂, 2 ♀, same data, emerged Feb-Apr. 29, Hering, no. 729. ♀, Verebély, Kertész, May 33. ♀, Austria, Alte Sammlung, labelled "*carbonaria* det. Schiner".

In the author's collection. ♂ (with preparation), Woodwalton Fen, Hunts., 23.VIII.60, ex *Phragmites communis*: emerged 27.X.60. ♂ ♀, same data, emerged April 1961.

Larval preparations ex Woodwalton Fen, Hunts., ex *Phragmites communis*.

In K. A. SPENCER's collection. 2 ♂ (with preparations), Wonwells, Devon, 15.IX.54, ex *Phragmites communis*: emerged 26.V.55 and 1.VI.55.



Figs. 20—23. Heads in profile of *Agromyza*: 20, *spenceri* sp. nov.; 21, *phragmitidis* Hendel; 22, ♀ *prespana* Hendel; 22a, male antenna of same; 23, *graminicola* Hendel

In the Groschke collection. ♂ ♀, Güntersberg-an-Oder, 28.II.29, ex *Phragmites communis*, leg. Hering. ♂, Neü-Freier (?), 29.IX.53, ex *Phragmites communis*.

In the Hering collection. 3 ♂ (with 1 preparation), ♀, Güntersberg-an-Oder, ex *Phragmites communis*: emerged Feb. '29: Hering, 3348. ♂ (with preparation), ♀, Crossen-an-Oder, Sept., ex *Phragmites communis*. ♂ (with preparation), Soritz, Beutzen, ex *Phragmites communis*, Spring, 1928, no. 62, leg. Schütze. ♀, same data, emerged 29.IX.27, leg. Schütze.

Puparial preparations from Bradons b. Nassau, end Sept., 1922: and St. Peter-Bord, 10.VIII.54, ex *Phragmites communis*, leg. Ludwig.

In the Nowakowski collection. ♂ (with preparation), Puzcza Kampinoska, Mfokiny, ex *Phragmites communis*; Saliceto-Populetum, larva 15.IX.55, puparium 27.IX, imago 11.VI.56, leg. Nowakowski: Inst. Zool. P.A.N., Warszawa, 60/57.

In the Rydén collection. ♀, Råå, Skåne, 2.VIII.35.

Besides the above records de Meijere (1925) knew this species in Holland (as *nigripes*), and Sasakawa (1956) records it for Japan. There are some other published records based on the mines being observed, but these require confirmation, as the mines are not distinguishable from those of *spenceri* and *hendeli*.

Distribution. England, Holland, Sweden, Germany, Austria, Hungary, Poland, Japan. Common in northern Europe where its host grows.

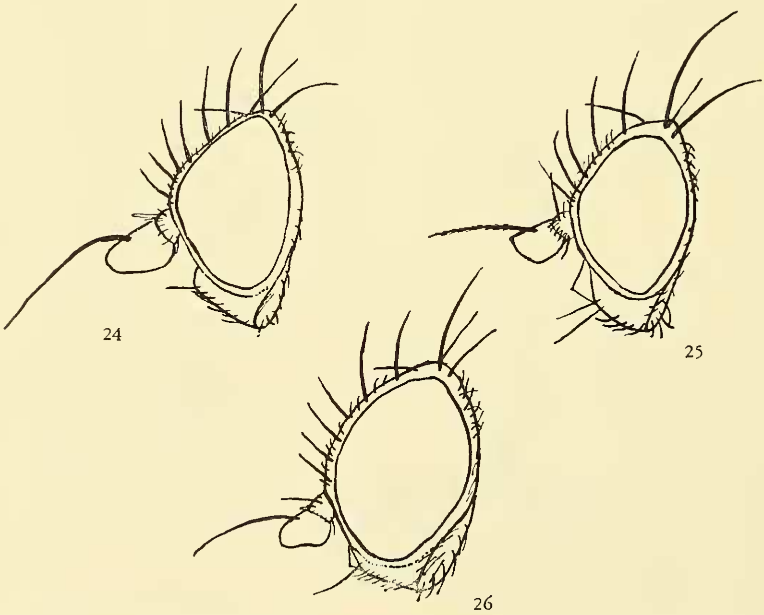
Host plant. *Phragmites communis* Trin.

Agromyza prespana Spencer 1957

Agromyza prespana Spencer, 1957, Ent. mon. Mag., vol. 93, p. 35.
Agromyza sp. b Hering, 1953, Tijdschr. PlZiekt., vol. 59, p. 109—191.

Textfigures 11a, 11b, 11c, 22, 22a, 33, 44a, 44d

Frons 1.4—1.5 times the width of an eye at the level of the front ocellus,



Figs. 24—26. Heads in profile of *Agromyza*: 24, *baetica* sp. nov.; 25, *distorta* Griffiths; 26, *oryzae* (Munakata)

slightly narrowing forwards; the antennae are separated at their bases. In profile (Fig. 22) the eye is large, its height about 7 times the height of the jowls at their centre. The orbits project above the antennae. Cheeks extremely narrow, almost eliminated below the antennae. 2nd antennal segment with its upper edge lengthened, so that the 3rd segment is directed downwards. 3rd antennal segment sexually dimorphic: in the male (Fig. 22a) larger with a very long fringe of upturned hairs: in the female (Fig. 22) a little longer than high with the fringe of hairs shorter. Facial keel clearly projecting in profile. 2 + 3 orbital bristles, fairly weak, the lower 3 directed inwards. Ocellar bristle also weak. Frons dark brown, first two antennal segments, sometimes also the third, yellow-brown, orbits and ocellar triangle shining black, lunule grey.

Acrostichals in 6—8 rows. Mesonotum very shining black. Legs with the tips of the femora yellow (especially the front pair) and all tarsi yellow-brown; sometimes also tibiae yellow-brown. The pubescense of the legs is short and fine.

Ratio of 2nd and 3rd costal segments (Fig. 33) 2.8—3.2; 2nd and 4th 3.6—4.2. Wing-tip nearer the end of r_{4+5} than m_{1+2}. Veins yellow-brown: membrane clear. Squama clear or white with a contrasting black fringe. Wing-length 1.9—2.1 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the end of the strengthened portion posterior to the attachment of the inner processes of the postgonites occupying slightly less than $^1/_5$ of the whole apodeme. Pregonites small, but strongly sclerotised, with obvious sensory pores on their inner edges. Postgonites small, club-shaped. Aedeagal hood very small and narrow, but strongly sclerotised. Phallophore much as in *albipennis* (Fig. 1), but with its postero-dorsal edge straight and strongly sclerotised.

Phallus fairly typical of the group. Basiphallus (Fig. 11c) consisting of two short rods, the right being broader than the left. Mesophallus consisting of two more or less triangular plates, pointed where they almost meet beneath the distiphallus (Fig. 11b). Distiphallus large, clearly longer than the basiphallus, its rear part strongly bent downwards.

Large characteristic ejaculatory bulb (Fig. 11a), broadened out like a fan distally. Stem by comparison very small.

Larva. The following characters have been described from the puparia. Mandibles (Fig. 44a) very small and narrow, with two teeth. Small protuberance posteriorly beneath the point of attachment of the labial sclerite.

Hind spiracles (Fig. 44d) situated on large projections: separated by over three times their own width: their adjacent bulbs forming an angle of about 90°.

The larval specimen figured by HERING (1953) as "*Agromyza* sp. *b*" is almost certainly identical with this species. This specimen shows a moderate-sized maxillary palpus, small antenna and a long narrow longitudinal sclerite (as normally in this group): also a clearly defined mandibular abductor apodeme. Labial sclerite strong and straight: processes of the paraclypeal phragma strongly sclerotised, but not widely splayed (contrast *graminicola*). Prothoracic girdle with about 6 rows of minute spines: mesothorax bare. Metathorax and first six abdominal segments with strong bands of spines, mostly directed posterodorsally: all bands broadest laterally, but strong dorsally too, continuing over the dorsal edge with several rows of spines: weaker ventrally. All spines somewhat blunt. Metathorax with about 10 rows laterally; first three abdominal segments with 14—18 rows; 4th and 5th with 10—14 rows; 6th with 12 rows of fine spines laterally, much weaker dorsally and ventrally: 7th and 8th segments and the anal region nearly bare. Front spiracles with 11—14 bulbs; bulbs of the hind spiracles characteristically twisted in side view (see Hering's figure).

Biology. There is one extant mine-specimen of *Agr.* spec. *b*. This is a gradually broadening mine beginning at the leaf tip, length about 4 cm, maximum width 4 mm. The frass particles are clearly defined.

Pupation probably outside the mine. The puparia are large and reddish.

One generation. Flies have been swept only in May/June. Groschke's bred material did not emerge until the following May.

Material examined. In the British Museum (Natural History). Type ♂, Lake Prespa, Macedonia, swept from vegetation near the lake, mid-June 1955, leg. Coe, B.M., 1955—460.

2 ♂ (with one preparation), 3 ♀, paratypes, same data. ♀, paratype, Lake Ochrid, Macedonia, early June 55.

♀ Polje, Dalmatia, Novigrad (in valley amid olive trees etc.), 27—31.V.58, leg. Coe, B.M., 1958—417.

In K. A. Spencer's collection. ♂ (with preparation), ♀, paratypes; same data as type.

In the Hendel collection. ♀ Prater, Wien, 19.V, leg. Hendel.

In the Groschke collection. ♀, Öffingen, Wttbg., 24.V.55, ex *Triticum*, leg. Groschke. ♀, Nekarrems, Wttbg. 18.V.55, ex *Triticum*, leg. Groschke. ♀ Berlin, Frohnen, 24.VI.28, leg. Hering.

In the Rydén collection. ♀, Skåne, Kullaberg, 20.VI.48.

In the Hering collection (Berlin). Larval preparation of "*Agromyza* sp.b", Görlitz, Kunnersdorf, 20.VI.52, ex *Triticum aestivum*, Hering, no. 5860.

Besides these records the puparia which de Meijere (1937) described from Czechoslovakia may belong here (see also Hering, 1957, no. 5305), but the description is inadequate.

Distribution. Southern Sweden, Germany, Austria, Jugoslavia (Dalmatia and Macedonia). It seems probable that this species was originally a southern form, which has spread northwards by becoming associated with wheat. In the Jugoslavian localities it is most unlikely that wheat was the food-plant.

Host plant. *Triticum aestivum* L.

Agromyza graminicola Hendel 1931

Agromyza graminicola Hendel, 1931, Flieg. pal. Reg., vol. 59, p. 122.

Textfigures 12a, 12b, 12c, 23, 34, 45a, 45b, 45d, 52

Frons narrow, 1—1.3 times the width of an eye at the level of the front

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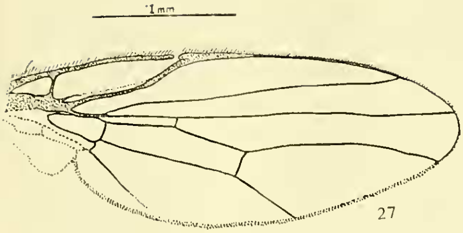
Figs. 27—37. Wing maps of *Agromyza*: 27, *albipennis* Meigen; 28, *nigripes* Meigen; 29, *lucida* Hendel; 30, *hendeli* sp. nov.; 31, *spenceri* sp. nov.; 32, *phragmitidis* Hendel; 33, *prespana* Spencer; 34, *graminicola* Hendel; 35, *baetica* sp. nov.; 36, *oryzae* (Munakata); 37, *distorta* Griffiths



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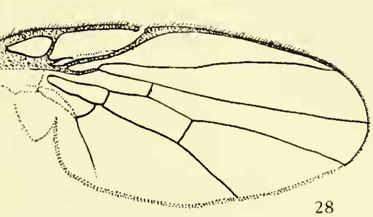

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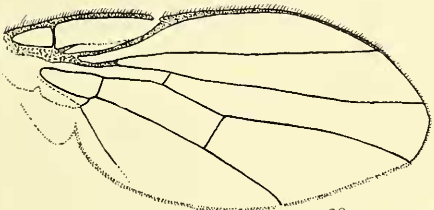

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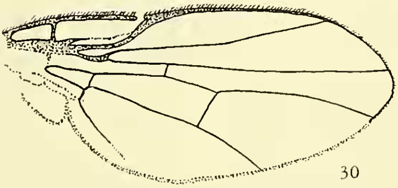

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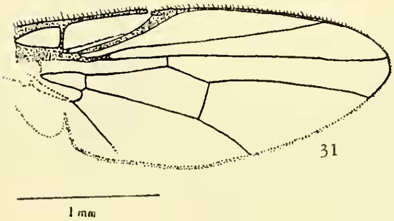

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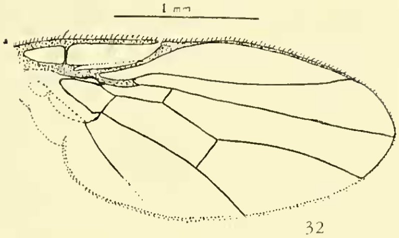

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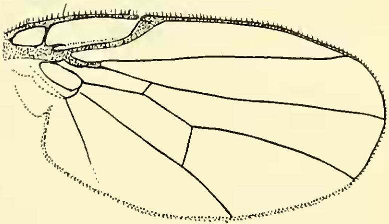

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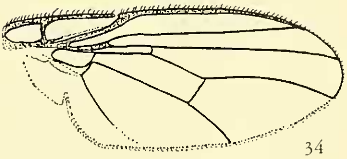

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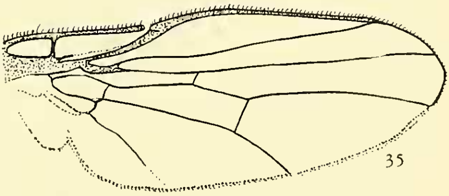

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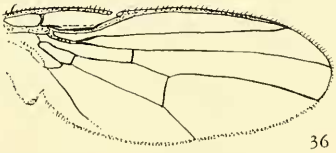

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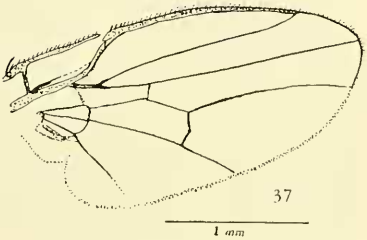

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ocellus: usually narrowing forwards. Antennae narrowly separated at their bases. In profile (Fig. 23) the cheeks are narrowly visible, but not clearly defined, below the eye. Orbits narrowly visible. Ratio of the eye-height to the height of the jowls 4—9. Eyes bare. 4—5 orbital bristles, not clearly differentiated into upper and lower orbitals: the third orbital directed more or less backwards: all orbitals often fairly small and weak. 3rd antennal segment very large, its lower margin evenly curved. Pubescence of antennae and arista fine. Frons and first two antennal segments dark brown.

Acrostichals 8-rowed. Legs dark brown to black, the front femora broadly yellow at their tips: tarsi sometimes brown.

Ratio of 2nd and 3rd costal segments (Fig. 34) 2.7—3.6: 2nd and 4th usually 5—5.8 (rarely as little as 4): 4th segment usually very short. Wing-tip between the ends of r_{4+5} and m_{1+2}. Veins pale: membrane clear. Squama white with a white fringe. Wing-length ♂ 2.0—2.2 mm, ♀ 2.4—2.6 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the end of the aedeagal hood 0.8 mm. Aedeagal apodeme thickened at its anterior end, more or less straight. The strengthened part posterior to the attachment of the inner processes of the postgonites is relatively short, occupying $^1/_6$ of the whole apodeme. 9th sternite stout and rounded, bearing a long hypandrial apodeme, which occupies about $^2/_5$ of the total length of the sternite: 9th sternite symmetrical (contrast *baetica*): tip of the hypandrial apodeme reaching nearly $^2/_3$ of the length of the aedeagal apodeme. Pregonites large, as figured for *nigripes* (Fig. 2), but with an anteriorly directed lobe on their inner anterior corners. Postgonites as figured for *nigripes* (Fig. 2): inner processes somewhat thickened where they curve down beneath the aedeagal hood. Aedeagal hood much deeper in profile than that figured for *albipennis* (Fig. 1): it is strongly sclerotised on its posterior surface. Phallophore relatively larger than that figured for *albipennis* (Fig. 1). Basiphallus (Fig. 12c) short and broad, asymmetrical, the left rod being obviously broader than the right. At the junction of the mesophallus and distiphallus on the left side a large downwards directed lobe. Mesophallus modified to form two club-shaped appendages, which lie beneath the distiphallus: the left appendage is slightly larger. Distiphallus (Fig. 12b) very large, a little longer than the basiphallus: its rear part bent downwards.

Ejaculatory bulb (Fig. 12a) fairly broad with a ribbed appearance: a characeristic "waist" at its base (contrast *baetica*): its sclerotisation moderate. Stem short, more or less straight.

Larva. There are no extant larval specimens. However the following characters have been described from the puparia. Mandibles (Fig. 45a) with 2 strong teeth: not so broad as those of *hendeli, spenceri* and *phragmitidis*. Labial sclerite (Fig. 45b) strongly thickened posteriorly: paraclypeal phragma strongly sclerotised, its processes large and widely splayed. Hind spiracles (Fig. 45d) separated by about 3 times their own width, with elongate-oval bulbs: adjacent bulbs forming an angle of 90°—100°.

Biology. Mine (Fig. 52) on upperside of leaf. Eggs laid singly near the edge of the leaf. The resulting larva produces a gradually broadening channel at first towards the leaf-tip, then turns towards the base of the leaf. Frass fairly conspicuous, in two irregular rows. Width of the mine channel not exceeding 4 mm.

Pupation follows in the mine (HERING, 1951a); puparia reddish-brown.

HERING (1951a) gives some interesting comments on the biology of this species. According to his observations it never attacks *Phragmites* standing in water, but only dwarf plants growing on quite dry ground.

At least two generations. Larvae taken in October produced flies in October and the following year. RYDÉN swept the flies in May and August.

Material examined. In the HENDEL collection. Type ♂ ♀ (both on the same mount), Crossen-an-Oder, emerged 10.X.34, ex *Phragmites communis*, Hering, no. 4295. 3 ♀, labelled Alte Sammlung, Wien. ♂, Hungaria, Lac. Fert., leg. Podkorny (with genitalia extruded).

(The original type mentioned by HENDEL (1931) was bred in the Vienna region, and must be presumed lost. There is no room for doubt as to the identity of this species.)

In the author's collection. ♂ (with preparation), Crossen-an-Oder, emerged 9.III.35, ex, *Phragmites communis*, Hering, no. 4295.

In the GROSCHKE collection. ♀ ♂, same data as type.

In the HERING collection. ♂ (with preparation), 2 ♀, same data as type, emerged Oct. 34 and March 35, Hering, no. 4295.

Also a puparial preparation ex Crossen-an-Oder, 8.X.34, ex *Phragmites communis*. Hering, no. 4295.

In the NOWAKOWSKI collection. ♂ (with preparation), Szeroky Bòr, Poland, ex *Phragmites communis*: puparium 17.VIII.58, imago 23.VIII, leg. Szepanski.

In the RYDÉN collection. ♀, Råå, 26.V.25. ♂ (with preparation), Skåne, Skälderviken, 15.VIII.55, leg. Ringdahl. 2 ♂ Skåne, Landskrone, 15 & 18.VIII.52.

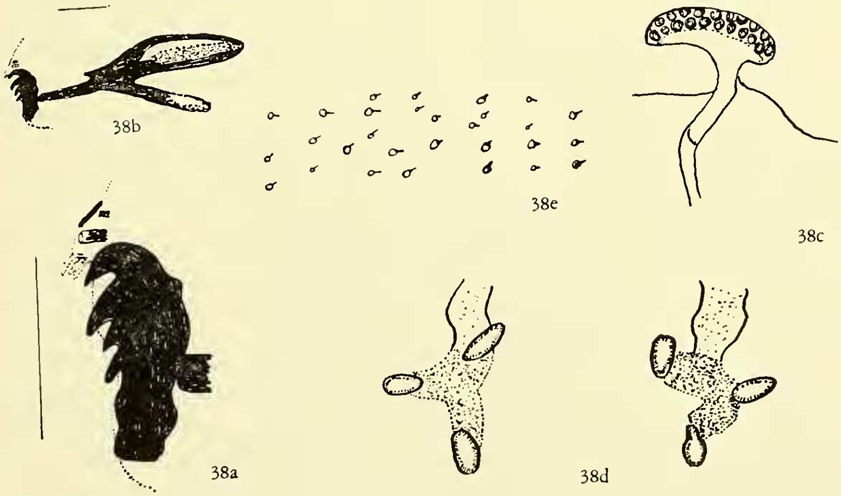


Fig. 38. Larval parts of *Agromyza nigripes* Meigen: a — mandibles; b — larval mouthparts; c — front spiracles; d — hind spiracles; e — section of the spinal band of the first abdominal segment laterally

Hering (1951) also observed this species in the Stockholm area, so that its range extends quite far north.

Distribution. Sweden, East Germany, Poland, Austria, Hungary.

Apparently this species does not reach Western Europe.

Host plant. *Phragmites communis* Trin.

Hering (1957) also keys this species under *Arundo*. I do not know the origin of this record, but must regard it as requiring confirmation, especially in view of the discovery of a related species in the Mediterranean area (described as *baetica* below).

Agromyza baetica spec. nov.

Textfigures 13a, 13b, 13c, 13 d, 24, 35, 46d, 53.

Frons fairly broad, 1.5 times the width of an eye at the level of the front ocellus: parallel-sided. Antennae separated by the width of their first segment at their bases. Cheeks and orbits clearly visible in profile (Fig. 24), especially the orbits above the antennae. Ratio of the eye-height to the height of the jowls 4—7. Eyes with obvious pubescence. 5—6 weak orbital bristles, all directed more or less backwards. Antennae with very large 3rd segment as in *graminicola*.

Legs black, apart from the tips of the front femora.

Ratio of the 2nd and 3rd costal segments (Fig. 35) 3—3.2, 2nd and 4th 3.2 to 4.5 (contrast *graminicola*): 4th segment relatively long. Veins pale: membrane pale. Squama white with a white fringe. Wing-length ♂ 2.1 mm, ♀ 2.6—2.8 mm.

Otherwise as for *graminicola*.

Male genitalia. Distance from the end of the aedeagal apodeme to the tip of the aedeagal hood 0.75 mm. Aedeagal apodeme short and thick, strongly bent along its length: its posterior end (after the attachment of the inner processes of the postgonites) broadened into a large head 4 times the width of the rest of the apodeme: this head occupies $^1/_6$ of the whole apodeme. 9th sternite (Fig. 13d) completely asymmetrical, its left side about twice as long as its right: it bears a large broad hypandrial apodeme about equal in length to the right (small) side of the 9th sternite: the tip of the hypandrial apodeme reaches nearly $^1/_2$ of the length of the aedeagal apodeme. Pregonites large: the left one rather angulate: the right folding over and joining with the phallophore. Postgonites conspicuous, not adpressed against the pregonites as in other species: inner process on left side short and strong: on the right side the phallophore, inner processes of the postgonite and the pregonite are obscured and partially fused. Aedeagal hood broad, deep in profile (as in *graminicola*).

Phallus (Fig. 13c) dominated by the enormous distiphallus which reaches back beyond the base of the basiphallus. Basiphallus V-shaped, short and strong, the left side broader than the right. Large anvil-shaped lobe on the left side at the junction of the basiphallus and mesophallus: this hangs downwards and is larger than in *graminicola*. Mesophallus developed into two large club-shaped appendages, the left one larger, bilobed at its tip. A conspicuous sclerotised band joins the two sides of the mesophallus across the top of the distiphallus. Distiphallus (Fig. 13b) as in *graminicola* but larger, over $1^1/_2$ times the length of the basiphallus.

Ejaculatory bulb (Fig. 13a) fairly broad, rounded, with a clearly defined central channel.

On external characters close to *graminicola*. The genitalia are however considerably modified.

Larva. There are no larval specimens. However the following characters have been described from the puparium with the type. Mandibles (Fig. 45a) and paraclypeal phragma (Fig. 45b) as described for *graminicola*. Hind spiracles (Fig. 46d) separated by 3—3½ times their own width, with elongate-oval bulbs: adjacent bulbs forming an angle of 80° (contrast *graminicola*). (More material is needed to confirm the constancy of this last character.)

Biology. Mine (Fig. 53) on upperside of leaf. Eggs laid singly near the leaf-margin, often several at different places on the same leaf. The resulting larvae eat first towards the leaf-tip, then turn and head for the base of the leaf. The mine gradually increases in width, but does not exceed 4 mm wide, remaining semi-linear. Frass in large conspicuous particles.

Pupation follows outside the mine, the puparia adhering to the leaf near the mine (contrast *graminicola*). Puparia reddish brown.

At least two generations. Larvae found in April produced flies between July and September. This suggests that in the wild the puparia aestivate (as with many Mediterranean species) and that there will be 2—3 generations during autumn, winter and spring.

Material examined. In K. A. SPENCER's collection. Type ♂ (with preparation), Algeciras, Spain, 25.IV.55, ex *Phragmites communis*: emerged 6.VII.55. Allotype ♀, same data, emerged 24.IX.55. Paratypes 5 ♀, same data, emerged July-Sept. 55.

In the author's collection. Paratype ♀, same data, emerged 22.IX.55.

HERING (1951a) also observed this species at a neighbouring locality (as *graminicola*).

Distribution. Southern Spain.

Host plant. *Phragmites communis* Trin.

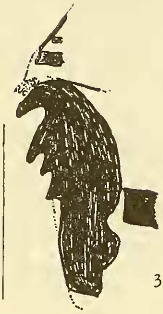
Agromyza oryzae (Munakata, 1910)

Oscinis oryzae Munakata, 1910, Konchu Sekai, vol. 14, p. 7—11.
Oscinis oryzella Matsumura, 1915. Man. Inj. Ins. Japan, vol. 2, p. 53.
Agromyza oryzae Hendel, 1931, Flieg. pal. Reg., vol. 59, p. 142; etiam Kuwayama et Kato.
Agromyza oryzella Yuasa & Koyama, 1938, Bot. & Zool., vol. 6, p. 820.

Textfigures 15a, 15c, 26, 36

A fuller synonymy is given by KATO (1956) from which the above is abridged. The following treatment owes much to that paper, which analysed the external characters of 165 Japanese specimens.

Frons narrow, as broad as, or a little exceeding the eye-width at the level of the front ocellus, parallel-sided. Antennae clearly separated at their bases. In profile (Fig. 26) the cheeks and orbits clearly visible, forming a continuous ring around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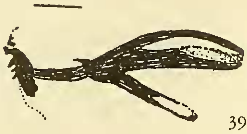
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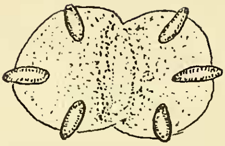
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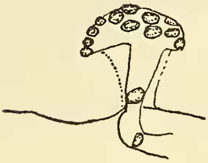
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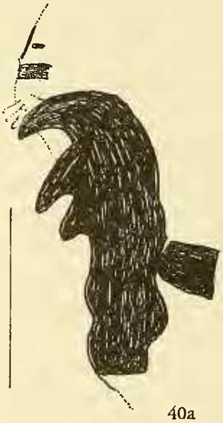
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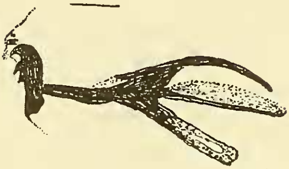
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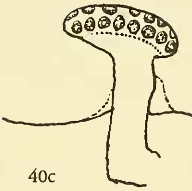
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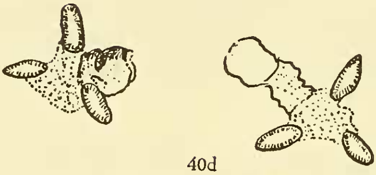
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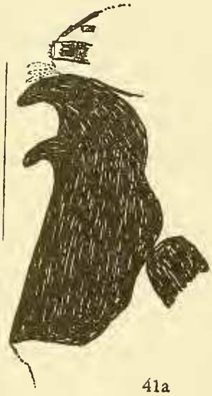
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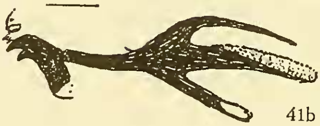
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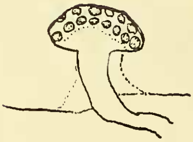
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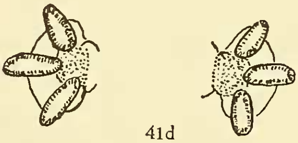
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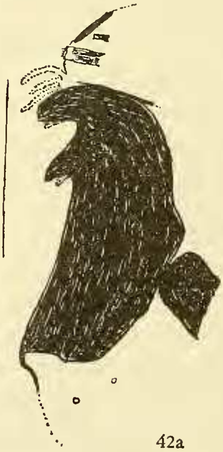
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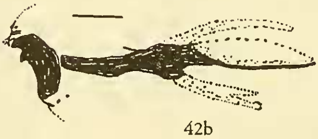
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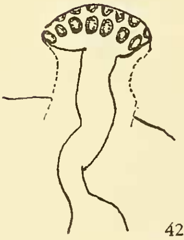
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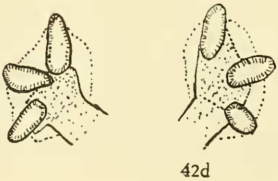

42d

the eye. Eyes with scattered white hairs. Eye-height about 5 times the height of the jowls. 2 strong upper orbital bristles directed backwards: 3—6 lower orbitals directed inwards and standing closer together than the upper orbitals. Ocellar bristles very small. 3rd antennal segment broadened, somewhat angular apically. Head usually entirely black; sometimes frons and first two antennal segments brownish.

Dorsocentrals strongly developed, normally 4 + 2 clearly visible in profile (two being presutural). Acrostichals arranged in 6 irregular rows. Legs black or dark-brown, sometimes the tips of the front femora and the front tarsi are yellowish. Front tibiae and tarsi with outstanding hairs on their anterior edge.

Ratio of 2nd and 3rd costal segments (Fig. 36) about 4; 2nd and 4th about 5. Wing-tip between the ends of m_{1+2} and r_{4+5}. Veins brown: membrane more or less clear. Squama greyish or ochreous, with a black or dark-brown fringe. Wing-length about 2.3 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the tip of the aedeagal hood 0.8 mm. Aedeagal apodeme more or less evenly curved downwards, heavily sclerotised. The strengthened part posterior to the attachment of the inner processes of the postgonites occupies $^1/_4$ of the whole apodeme. 9th sternite rather straight-sided, bearing a short indistinct hypandrial apodeme. The pregonites are as figured for *nigripes* (Fig. 2): postgonites larger than those figured for *nigripes* (Fig. 2). Aedeagal hood large, weakly sclerotised around its edges. Phallophore not clearly indented on its posterior edge in lateral view (compare *albipennis*, Fig. 1).

The basiphallus (Fig. 15c) consists of two rods, the left being obviously broader than the right. Mesophallus without any clearly defined "thorn" (contrast *distorta*): the right side forms a weakly sclerotised lobe. Distiphallus very short, clearly shorter than the basiphallus.

Ejaculatory bulb (Fig. 15a) moderately sclerotised, except along its distal edge, a little narrower than long: central channel visible, reaching almost to the distal edge. Stem fairly short, weakly sclerotised.

Larva. The larva may be compared with that of *distorta* as follows. For a more detailed description and figures consult KATO (1956).

Mandibles with 5 (rarely 4) alternating teeth (as figured for *distorta*). Paraclypeal phragma largely pale brown. Patches of bristle-like spines on the locomotory humps (Kriechwülsten) of the mesothorax, metathorax and all abdominal segments.

Front spiracles with 88—133 bulbs, distributed over the entire surface of the spiracle. Posterior spiracles much as figured for *distorta,* narrowly separated.

Biology. Mine on upperside of leaf. Eggs laid singly near the leaf-tip; the resulting larva produces a gradually broadening mine, heading towards the base

Figs. 39—42. Larval parts of *Agromyza*: 39, *albipennis* Meigen; 40, *lucida* Hendel; 41, *hendeli* sp. nov.; 42, *phragmitidis* Hendel. a — mandibles; b — larval mouthparts; c — front spiracles; d — hind spiracles of the leaf. Frass particles fairly conspicuous, scattered. Zig-zag feeding lines visible. (Only one mine specimen was available, so I do not know if this is typical).

Pupation follows outside the mine. There is puparial dimorphism as in *distorta,* but not so strongly marked as in that species. KUWAYAMA (1950) noted the following important differences between the two types of puparia.

(In mm)	*Hibernant puparium*	*Non-hibernant puparium*
Mean length	2.598	2.855
Mean width	1.645	1.595
Mean height	1.542	1.385
Thickness of puparial skin	0.0294	0.0205
Colour	Dull black, rarely brownish black	Pale greenish brown, brown or dark-brown, rarely blackish, glossy.

KATO (1956) adds the following: "Hibernant puparium: Generally all the segments not polished as having many microscopic furrows or lumpy surface; second to fifth abdominal segments more or less subshiny, each having a distinct transverse keel girdling median position; sixth and seventh abdominal segments, each with weakly developed keels on both lateral sides, having several longitudinal and oblique keel-like wrinkles on dorsum: eighth abdominal segment generally without median keel or distinct wrinkles: anterior spiracles protruded rather laterad and the distal surface of each spiracle directed strongly or sometimes almost entirely laterad.

Non-hibernant puparium: Generally all the segments smooth and shiny, without any distinct keel or wrinkle; last three segments sometimes more or less subshiny according to the existence of microscopic furrows; anterior spiracles protruded rather ventrad and the distal surface of each spiracle directed strongly or sometimes almost entirely ventrad."

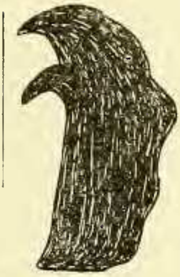
These differences correspond with those observed in the European *distorta.* In that species the differences are even more marked. KUWAYAMA also observes that the hibernant puparium "does not adhere closely to the rice-leaf", while the non-hibernant type does. This too is confirmed by my observation of *distorta.*

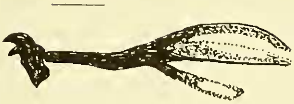
There are at least two generations. In Japan the first generation of larvae feed in June. Further details of the life-history are not known to me, though they are probably given in some of the Japanese papers listed by KATO (1956) in his synonymy. The flies were taken freely in June.

Material examined. In the HENDEL collection. ♂ (with preparation), type of the synonymous *Agr. oryzae* Hendel, ex *Oryza sativa*, Nikolsk-Ussurisk, Süd-Ussurigebiet, Siberia, 27.VII.28.

Distribution. Northern Japan (Hokkaido, Tohoku and Hokuriku provinces), East Siberia (South-Ussuri province).

Host plants. Gramineae, tribe Oryzeae: *Oryza sativa* L., *Zizania latifolia* Turcz.


43a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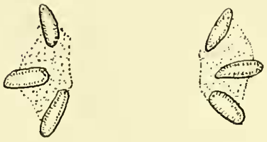
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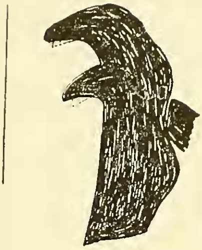
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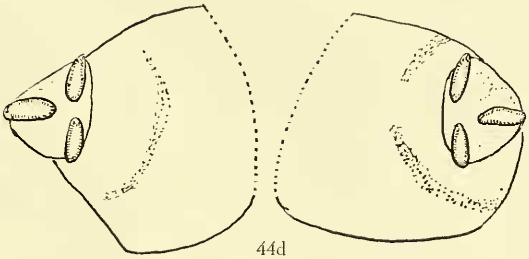
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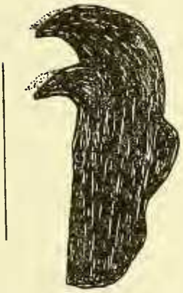
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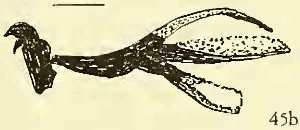
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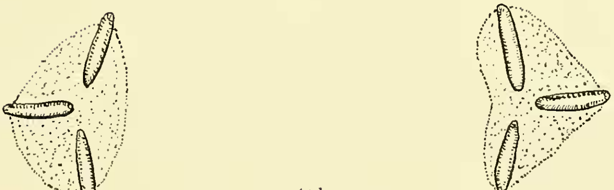
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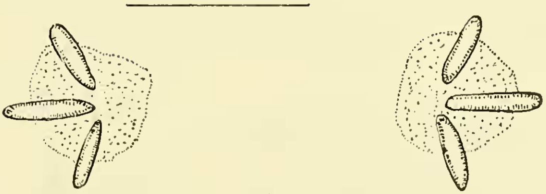

46d

Figs. 43—46. Larval parts of *Agromyza*: 43, *spenceri* sp. nov.; 44, *prespana* Spencer; 45, *graminicola* Hendel; 46, *baetica* sp. nov. a — mandibles; b — larval mouthparts; d — hind spiracles

Agromyza distorta Griffiths 1955

Agromyza distorta Griffiths, 1955, Ent. Gaz., vol. 6, p. 10—12.

Textfigures 14a, 14b, 14c, 25, 37, 47a, 47c, 47d, 47e, 47f

Frons very broad, 1.5—2 times the width of an eye at the level of the front ocellus, parallel-sided. Antennae clearly separated at their bases. In profile (Fig. 25) the cheeks and orbits clearly visible, forming a continuous ring around the eye. Eyes with scattered white hairs. Ratio of the eye-height to the height of the jowls 5—7; 4—5 strong orbital bristles, clearly differentiated into upper and lower orbitals: the upper directed backwards, the lower inwards. Ocellar bristles normal-sized, reaching beyond the bases of the 2nd pair of upper orbitals. 3rd antennal segment broadened apically, rather short, somewhat angulate at its apex. Colour of head entirely black, or at most the lunule and first antennal segment brown.

Dorsocentrals strongly developed (as *oryzae),* 4 + 1 or 4 + 2 clearly visible in lateral view, one or two presuturals being clearly developed. Acrostichals 8-rowed. Legs black, except for the yellow tips of the front femora. Front tibia with strong hairs on its anterior edges (though not so marked as in *oryzae*).

Ratio of the 2nd to 3rd costal segments 2.7—3; 2nd to 4th 4—5. Wing-tip between the ends of r_{4+5} and m_{1+2}. Veins brown: membrane strongly brownish tinged. Squama ochreous or dark grey with a dull black fringe. Wing length 2.5 mm.

♂ genitalia. Distance from the end of the aedeagal apodeme to the tip of the aedeagal hood 0.9 mm. Aedeagal apodeme heavily sclerotised, somewhat bent downwards; the strengthened part posterior to the attachment of the inner processes of the postgonites occupying a little less than $^1/_4$ of the whole. 9th sternite short and rounded (compare *nigripes,* Fig. 2), heavily sclerotised. Hypandrial apodeme short, its tip reaching $^1/_2$ of the length of the aedeagal apodeme. Pregonites large (compare *nigripes,* Fig. 2): postgonites larger than those figured for *nigripes* (Fig. 2), rounded. Aedeagal hood as for *nigripes,* but more weakly sclerotised around its edges. Phallophore as figured for *albipennis* (Fig. 1).

Basiphallus (Fig. 14c) consisting of two rods of moderate width: mesophallus asymmetrical: its left side developed into a black "thorn", while its right forms an ill-defined lobe of tissue. Distiphallus (Fig. 14b) very short, clearly shorter than the basiphallus.

Ejaculatory bulb (Fig. 14a) drop-shaped, weakly sclerotised, almost transparent in its distal $^1/_3$: central channel clearly visible, reaching to $^2/_3$ of the length of the bulb: distal edge delicately rounded. Stem fairly short.

Larva. The following description is partly based on HERING (1956) who gives a very detailed account of the larva.

Antennae and maxillary palpus small: longitudinal sclerite and mandibular abductor apodeme absent. Mandibles (Fig. 47a) long, with 5 alternating teeth: the upper two teeth longer than the lower three: right mandible higher than the left. Distinct mandibular adductor apodeme present. No filaments above the mandibles.

Labial sclerite slender: paraclypeal phragma strongly sclerotised.

Head bare. Prothoracic girdle consisting of about 8 rows of minute spines. Metathorax bare. Dorsal edge of abdomen bare: strong bands laterally on the metathorax and first three abdominal segments consisting of 14—18 rows of spines: bands of the following segments decreasing progressively. Metathorax and first three abdominal segments ventrally with a thick patch of elongate, bristle-like spines on their locomotory humps (Kriechwülsten). 8th segment laterally, 7th and 8th ventrally, and the anal region with small fine spines.

Front spiracles (Fig. 47c) large and circular, bearing 200—250 bulbs distributed over their whole surface: atrium short. Hind spiracles (Fig. 47d) projecting somewhat, narrowly separated from each other, with 3 small egg-shaped bulbs: adjacent bulbs forming an angle of about 90°.

Length (full-grown) about 5 mm.

Biology. Mine on upperside of leaf. Eggs laid singly near the edge of the leaf. The larva first produces a long narrow channel towards the leaf-tip, then turns and produces a large irregular blotch-mine. Frass particles scattered regularly throughout the mine. Zig-zag feeding lines visible. Often several mines coalesce to consume the whole leaf.

Pupation follows outside the mine. The winter puparia (Fig. 47e) are only weakly attached to the leaf (the ventral surface not being flat) and easily fall into the water.

The puparia are strongly dimorphic. The winter puparia (Fig. 47e) are black, thick-shelled, strongly arched dorsally and obviously hollowed ventrally: the hind end is very abruptly cut off. The summer puparium (Fig. 47f) is more elongate, red, thinner-shelled, of fairly normal shape for the group: dorsal edge only moderately arched: ventral surface flat: hind end less abruptly cut off. The same phenomenon occurs in *oryzae*, though to a lesser degree: detailed analyses by Japanese workers are summarised under that species.

This species attacks large *Glyceria* plants growing in the water. The highly modified front spiracles represent an adaptation to an aquatic environment (there are several other instances in the Agromyzidae of startling changes in the structure of the spiracles in species feeding on aquatic hosts). Nearly all the winter puparia must end up in the water, as they are only very loosely attached to the leaf. Furthermore I observed that one puparium (from which the type specimen later emerged) was situated on a leaf which could only have been reached by the larva crawling underwater. The patches of bristle-like spines on the ventral locomotory humps clearly are a device to assist the larva in gripping a surface. These are more strongly developed in *oryzae*.

Two generations. The larvae of the second generation are found in September.

Material examined. In the author's collection. Type ♂ (with preparation) Ash Vale, Surrey, 5.IX.53, ex *Glyceria maxima*: emerged 18.V.54.

In the HERING collection (Berlin). ♂ (with preparation), Aken, on the river Elbe, with summer puparium, but no further data.

Distribution. England, Germany. Apparently a rare species. Not common at the type locality.

Food plant. *Glyceria maxima* (Hartm.) Holmb.

Agromyza lunulata Sasakawa 1956

Agromyza lunulata Sasakawa, 1956, Sci. Rep. Saikyo Univ., Agr., vol. 8, p. 124—125.

This species was described from a single swept female. I have not attempted to include it in this paper. Sasakawa (1956) states that it is allied to *distorta.* However until a male or the immature stages are found the question must remain open. The external characters of the type certainly resemble *distorta,* but the third antennal segment is clearly longer. Unfortunately no female of *distorta* is available yet for comparison.

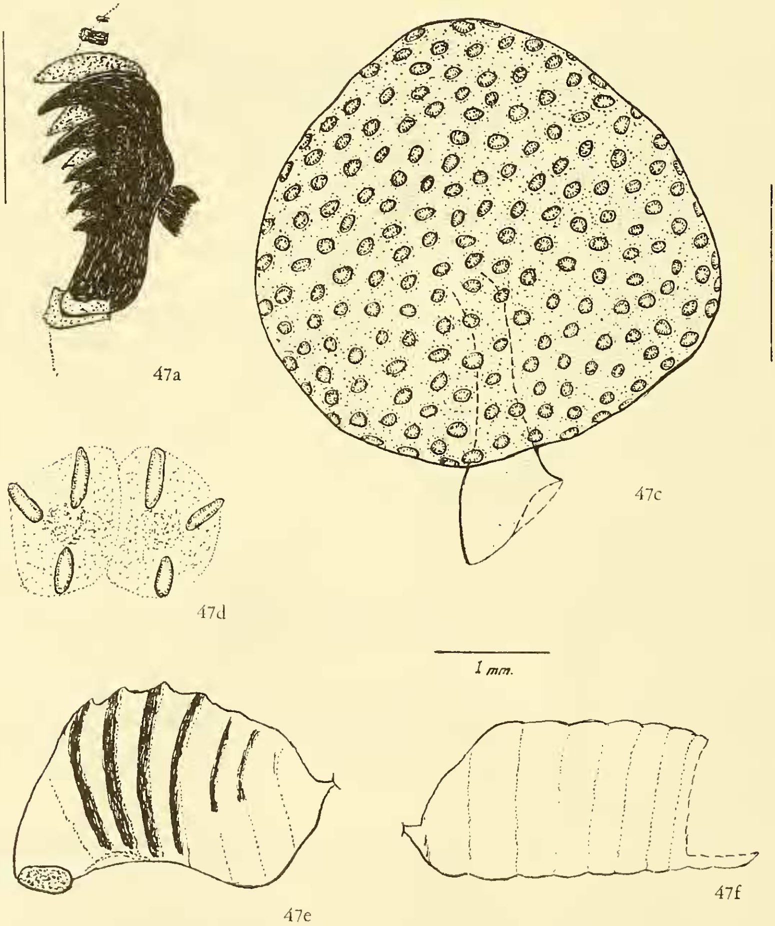


Fig. 47. Larval parts of *Agromyza distorta* Griffiths: a — mandibles; c — front spiracles; d — rear spiracles; e — winter puparium; f — summer puparium (with front spiracles missing)

The original description gives full details of the external morphology of the type with figures of the head and wing.

PARASITES

The majority of Agromyzid parasites belong to the Chalcid family Eulophidae and Braconids of the genus *Opius* and the tribe Dacnusini. Species of each of these groups occur as parasites of the *nigripes* group. There is no evidence of hyperparasitism.

One species of the Eulophidae has been bred freely from puparia of *Agromyza albipennis* Mg. on *Phalaris arundinacea.* These Chalcids are unfortunately not yet identifiable. The absence of Chalcid parasites from the majority of the species of the *nigripes* group is noteworthy. In the *Poëmyza* species, for instance, which also feed on Gramineae the Chalcids form numerically the greater part of the parasites.

Several *Opius* spp. occur freely here. These too are not yet identifiable, but this should be remedied soon, as Dr. MAX FISCHER of Vienna is working on the group, and has been sent much material bred from the Agromyzidae.

I can however give a reasonable account of the Dacnusini, which form the majority of the parasites of this group. Some records were included in my paper "Host Records of Dacnusini (Hym., Braconidae) from leaf-mining Diptera" in 1956. More can now be added. Mr. G. E. J. NIXON of the Commonwealth Institute of Entomology has been kind enough to assist me in identifying these species. All the specimens mentioned here have either been named by him, or by myself by comparison with specimens named by him.

Antrusa melanocera (Thomson)

In GRIFFITHS (1956) this species was recorded as bred from *albipennis, nigripes* and *distorta.* I can now add the following records.

Ex *Agromyza nigripes* Mg. on *Glyceria fluitans* and *G. maxima* collected at Ash Vale, Surrey, 5 & 6.IX, 15 examples emerged in Sept./Oct. and April/May. Ex *Agr. albipennis* Mg. on *Phalaris arundinacea,* same data and locality, 2 examples emerged 12.X and 14.III. Ex *Agr. distorta* Grif. on *Glyceria maxima,* same data and locality, one example emerged 3.X. Ex *Agr. lucida* Hd. ex *Glyceria maxima,* same date and locality, one example emerged 19.III.61. Ex *Agr. albipennis* Mg. on *Phalaris arundinacea,* Woodwalton Fen, Hunts., 22.VIII.60, one example emerged 4.IX.61.

These records add one further host, *Agr. lucida* Hd. The species is clearly common on *nigripes,* but is less frequent on the related *albipennis.* At the Ash Vale locality, where *distorta* and *lucida* are found feeding together with *nigripes* on *Glyceria maxima, Antrusa melanocera* has occurred on all three species. However only one example has been bred from *lucida,* so that it seems probable that *nigripes* represents the main host, from which I have bred about 25 specimens. The occurence of this species on *distorta* represents a clear case of disjunctive oligophagy, for it does not occur on the *Phragmites*-feeding species which are more closely related to *nigripes* than is *distorta.* This transference has clearly been facilitated by the fact that *distorta* occurs on the same food-plant as *nigripes.*

Antrusa spec. *a*

Four examples of another *Antrusa* species were bred from *Agr. lucida* Hd. on *Glyceria maxima,* Ash Vale, Surrey, 5.IX.60, emerged 27.III—7.IV.61.

These specimens differ from typical *melanocera* in the more striate sculpture of the petiole and the fewer hairs on tergite 3 + 4 and it is possible that they represent a distinct species. One specimen of the normal *melanocera* was also bred from the same host.

Dacnusa nydia Nixon

It has now become clear that this species, as formerly conceived, is composite. The true *nydia* is a parasite of *nigripes* though it is much less common than *Antrusa melanocera.* Three examples were recorded by Griffiths (1956). Three more can now be recorded, bred from *Agr. nigripes* Mg. on *Glyceria maxima,* Ash Vale, Surrey, 5.IX.60, emerged 3.X.60 and March/April 1961.

Dacnusa sp. *a (nydia* group)

This species is represented by one specimen only bred from *Agr. phragmitidis* Hd. on *Phragmites communis,* Slapton, S. Devon, emerged April '55 (K. A. Spencer).

Dacnusa spec. *b* (*nydia* group)

This species has been hitherto included under *nydia* but can be easily recognised by its possession of yellow tarsi with a contrasting black 5th segment, and its broader petiole. My records are as follows:

Ex *Agromyza hendeli* spec. nov. on *Phragmites communis,* Woodwalton Fen, Hunts., 23.VIII.60, 3 examples emerged 18—20.IX.60. Ex *Agr. phragmitidis* Hd. on *Phragmites communis,* Woodwalton Fen, Hunts., 28.IX.60, 5 examples emerged April/May '61. One example from the same host and food-plant, Slapton, S. Devon, emerged April '55 (K. A. Spencer).

The species is clearly a common parasite of both the British *Phragmites*-feeding species, *hendeli* and *phragmitidis.*

Dacnusa cincta Haliday

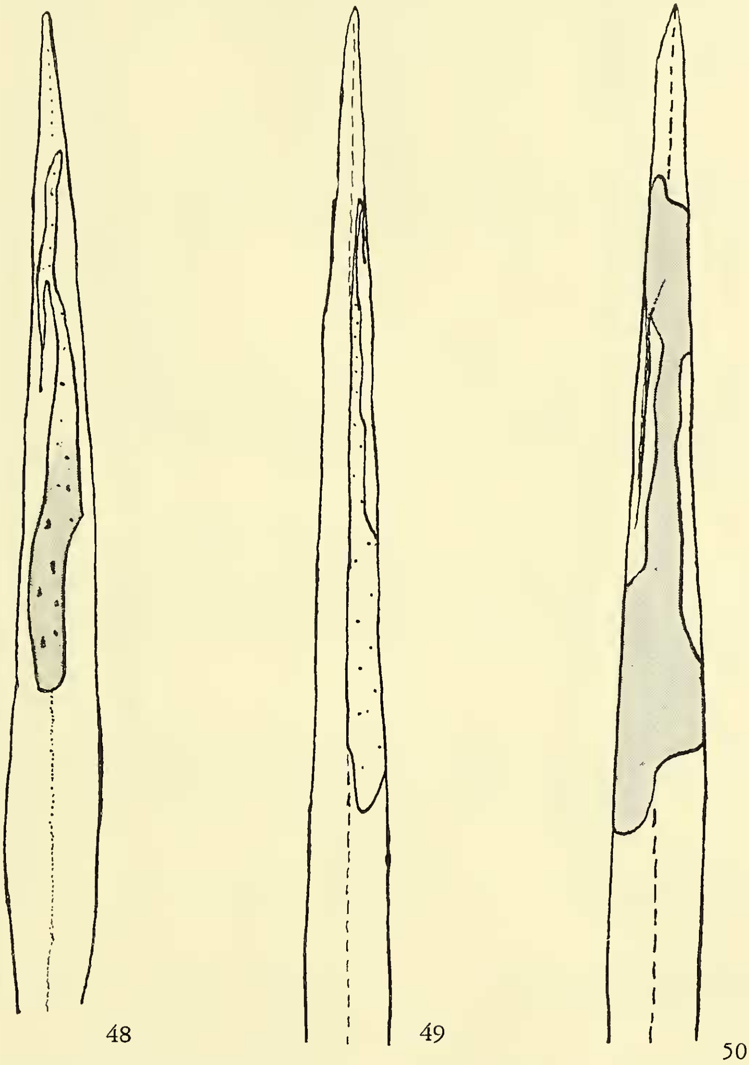
This large characteristic species has been bred from *Agr. lucida* on two occasions, the details being as follows:

Ex *Agromyza lucida* Hd. on *Deschampsia caespitosa,* Brookman's Park, Herts., 6.VIII.54, 4 examples emerged 1.IX.54 and 9—10.V.55. Ex *Agr. lucida* Hd. on *Glyceria maxima,* Ash Vale, Surrey, 5.IX.60, one example emerged 3.V.61.

Dacnusa pione Nixon

This is another large species related to *cincta,* of which only two Swedish examples have been hitherto known. I have now bred two specimens from *Agr. phragmitidis* Hd. on *Phragmites communis,* Woodwalton Fen, Hunts., 23.VIII.60 & 28.IX.60, emerged 10.VII.61.

The late emergence dates are noteworthy and suggest that the species may be single brooded. In captivity the vast majority of *Dacnusini* emerge before mid-May from overwintering puparia.



Figs. 48—50. Leaf-mines of *Agromyza*: 48, *albipennis* Meigen on *Phalaris arundinacea*; 49, *nigripes* Meigen on *Glyceria maxima*; 50, *lucida* Hendel on *Glyceria maxima* (natural size)

Dacnusa lugubris Nixon

Nixon (1945) records several examples of this species as having been bred by Hamm and Blair from "*Agromyza nigripes* on reeds". Judging from the late dates (September and October) on which the puparia were collected, these records probably refer to *Agr. phragmitidis* Hd., and I have listed this species as a parasite of that fly.

The species recorded in GRIFFITHS (1956) as *lugubris* from *Phytomyza pseudohellebori* Hendel has been re-examined by NIXON, who now states that it is definitely not the true *lugubris*. The species related to *lugubris* are a difficult group which is clearly in need of revision.

Dacnusa spec. *c* (*lugubris* group)

One example of a form near *lugubris* was bred from *Agr. nigripes* Mg. on *Glyceria maxima,* Ash Vale, Surrey, 5.IX.60, emerged 2.III.61. It is improbable that this is conspecific with the species bred from "reeds", referred to above as *lugubris.*

Dacnusa ninella Nixon

NIXON (1945) refers to this species three examples bred by HAMM from "*Agromyza nigripes* on reeds" from puparia taken in October near Oxford. It was bred together with *lugubris*. The host is probably *Agr. phragmitidis* Hd. and I have listed *ninella* as a parasite of that species.

Dacnusa spec. *d* (*lugubris* group)

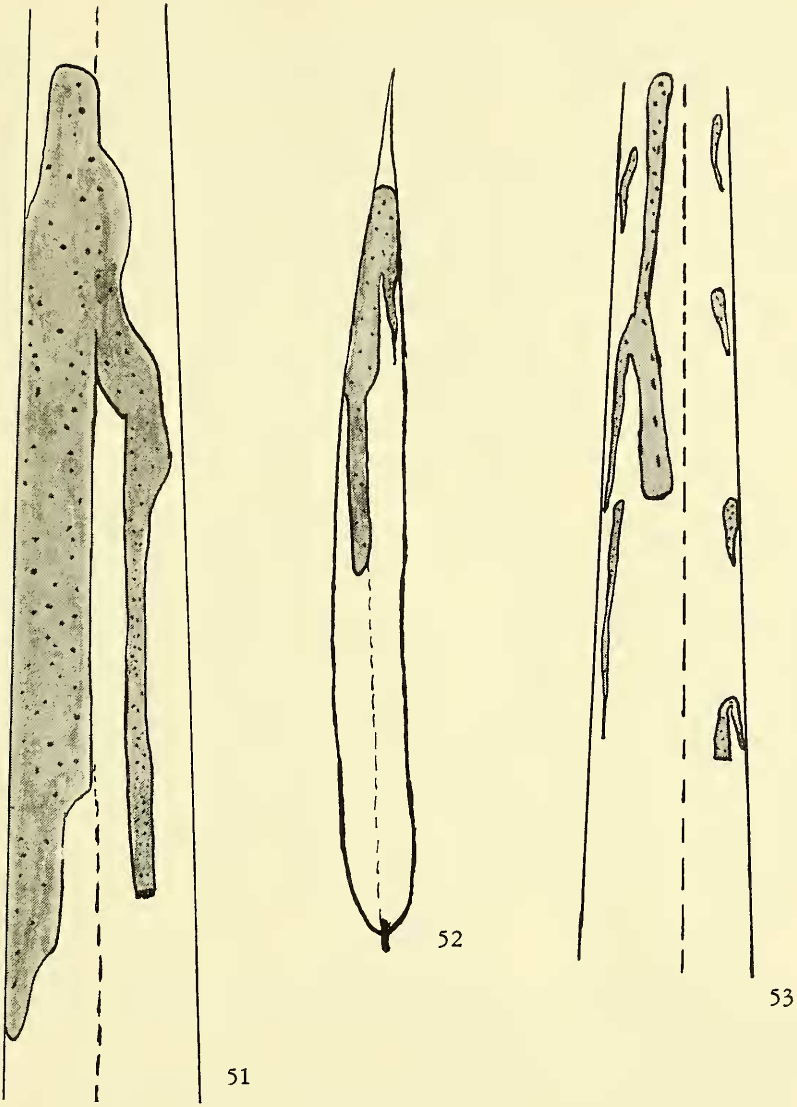
One example of an obviously distinct *Dacnusa* spec., probably referable to the *lugubris* group, was bred from *Agr. distorta* Grif. on *Glyceria maxima,* Ash Vale, Surrey, 5.IX.54, emerged 26.IV.55.

Dacnusa spec. *e*

One example of a new *Dacnusa* species was bred by SPENCER from *Agr. baetica* spec. nov. on *Phragmites communis,* Algeciras, S. Spain, 25.IV.55, emerged 25.V.55. As with most Dacnusini from the mediterranean area it is undescribed.

The following is the list of the known Dacnusine parasites from each species of the *nigripes* group.

Agromyza albipennis Meigen	*Antrusa melanocera* (Thomson)
A. nigripes Meigen	*Antrusa melanocera* (Thomson)
	Dacnusa nydia Nixon
	,, spec. *c* (*lugubris* group)
A. lucida Hendel	*Antrusa melanocera* (Thomson)
	,, spec. *a*
	Dacnusa cincta Haliday
A. hendeli spec. nov.	*Dacnusa* spec. *b* (*nydia* group)
A. phragmitidis Hendel	*Dacnusa* spec. *a* (*nydia* group)
	,, spec. *b* (*nydia* group)
	,, *pione* Nixon



Figs. 51—53. Leaf-mines of *Agromyza*: 51, communal mine of *phragmitidis* Hendel on *Phragmites communis* (compare also *spenceri* sp. nov. and *hendeli* sp. nov.); 52, *graminicola* Hendel on *Phragmites communis*; 53, *baetica* sp. nov. on *Phragmites communis* (with young mines). Natural size

	Dacnusa lugubris Nixon
	„ *ninella* Nixon
A. baetica spec. nov.	*Dacnusa* spec. *e*
A. distorta Griffiths	*Antrusa melanocera* (Thomson)
	Dacnusa spec. *d* (*lugubris* group)

The species with the widest range of hosts is *Antrusa melanocera* (see the discussion under that species). Of the other species *Dacnusa* spec. *b* occurs on both *hendeli* and *phragmitidis*, the two *Phragmites*-feeding species, while the other species of Dacnusini are recorded from one host only. It is probable however that some of the species bred from *phragmitidis* will also occur on *hendeli.*

Agromyza albipennis Mg. appears to have few parasites. The only Dacnusine which has been bred from it is *Antrusa melanocera,* and that is far commoner on *nigripes*. The flies can always be bred with the greatest of ease. The absence of parasite records from other species is of course due to the absence of material.

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Summary

1. The characters of the *nigripes* group of the genus *Agromyza* Fallén are defined. All the eleven Palaearctic species, including three, new to science, are described and also two new subspecies.

2. The male genitalia of all species and subspecies are described and figured for the first time.

3. The known larvae are described and figured: where larvae were not available, larval characters have been reconstructed as far as possible from the puparia. An attempt is made to rectify the considerable confusion which has reigned hitherto over the identification of the larvae, and in particular the true *nigripes* larva is described for the first time.

4. Details of the biology of all species are given as far as they are known.

5. The name *lucida* Hendel 1920 is removed from the well-known *Phragmites* species, to which it was wrongly applied by Hendel himself, and returned to the original species. The *Phragmites*-feeder is redescribed as *hendeli* spec. nov.

6. Detailed records are given of the distribution of all species. Two species, *albipennis* and *phragmitidis*, extend right across the Palaeartic region to Japan: three other species, *nigripes, hendeli* and *lucida*, are wide-spread in temperate Europe. The known distribution of the other species is more restricted.

7. An attempt is made to clarify the host-relationship of *albipennis, nigripes* and *lucida,* which are recorded from many hosts.

8. Keys for the identification of adults and larvae are given.

9. Chapters on phylogenesis, host-relationship and previous workers' treatment of the group are included.

10. An account of the species of Dacnusini (Hym. Braconidae), parasitic on this group, is given.

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